IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XXI JULY 1942

[WATERSTON (J. M.).] **Plant pathology.**—*Rep. Dep. Agric. Bermuda, 1941*, pp. 8–9, 1942.

The most destructive disease investigated during the period under review [cf. *R.A.M.*, xx, p. 392] was potato blight (*Phytophthora* [*infestans*]), which caused heavy losses during the last few days of the year. Leaf roll was prevalent in Bliss Triumph potatoes grown from Long Island seed, up to 40 per cent. infection being recorded compared with only 5 per cent. for Nova Scotian material. Black rot of broccoli (*Xanthomonas campestris*) and tomato fruit spot (*X. vesicatoria*) were encouraged by the wet weather in December. A Discomycete that developed on loquat fruits in the laboratory was identified by H. H. Whetzel as a new species of *Lambertella*, which has also been collected on *Jasminum simplicifolium* berries, while a fungus found on fiddlewood (*Citharexylum spinosum*) may prove to be the same. *Botryosphaeria ribis* (also in its imperfect *Dothiorella* stage) occurred in a weakly parasitic form on cassava, the first report of the organism on this host in Bermuda. Another new record for the island was *Puccinia secalina* on a small experimental planting of rye, an obvious case of seed transmission. New hosts for *Sclerotinia sclerotiorum* included swedes and *Anemone coronaria*, while *Botrytis cinerea* was observed for the first time causing chocolate spot of broad bean.

NANCE (NELLIE W.). **Diseases of plants in the United States in 1939.**—*Plant Dis. Reptr, Suppl.* 128, 378 pp., 12 graphs, 9 maps, 1941. [Mimeographed.]

This, the 23rd annual report compiled by the Plant Disease Survey of the United States Department of Agriculture, is drawn up on the familiar lines of preceding reports [*R.A.M.*, xix, p. 692].

Report of progress for year ending June 30, 1941.—*Bull. Me agric. Exp. Sta.* 405, pp. 401–535, 3 figs., 3 graphs, 2 maps, 1941.

This report [cf. *R.A.M.*, xviii, p. 577] contains the following items of phytopathological interest. D. Folsom describes the effects of different spray and dust materials on scab [*Venturia inaequalis*], growth, and yield in two McIntosh apple orchards. In one, two rows of trees 27 years old were given the same treatment from 1920 to 1934, after which one received full-strength and the other half-strength lime-sulphur for four years. Both then received identical treatment for two years. When the strength of the lime-sulphur was reduced, the yield was increased at first, but in the second year the yield of scabby fruit was increased by nearly a bushel per tree.

In the second orchard, 335 trees set out in 1928 and treated as follows, viz., (*a*) dry lime-sulphur 1928 to 1940, (*b*) dry lime-sulphur 1936 to 1940, (*c*) mild sulphur (flotation, bentonite, applied as a spray) 1928 to 1940, and micronized 1940, and (*d*) bentonite sulphur dust (1928 to 1940, 1·10 lb. per tree in 1940) gave, respectively, in 1940, 93·8, 92·6, 96·9, and 79·6 per cent. clean fruit. The mild sulphur spray and

sulphur dust did not affect the amount of wood formed as represented by trunk girth while nearly doubling the yield owing to an increase in the number of fruits per tree.

R. M. Bailey and I. M. Burgess state that the Maine No. 2 cucumber is of high table quality and very resistant to *Cladosporium cucumerinum* [ibid., xx, p. 510].

Observations by R. Bonde and B. E. Plummer indicated that the Katahdin, Chippewa, and Sebago potato varieties are very susceptible to injury resulting from seed treatments against *Rhizoctonia* [*Corticium solani*]. In an experiment carried out in 1940 seed potatoes of the Sebago, Green Mountain, and Irish Cobbler varieties were treated in mercuric chloride solution (0·2 per cent.) plus acetic or hydrochloric acid (1 per cent. of either) for 5 and 10 minutes. All the varieties were injured and pitted by the treatments, damage being most severe on Sebago, in which 43 to 59 per cent. of the seed pieces failed to sprout.

R. Bonde states that potato ring rot [*Bacterium sepedonicum*: ibid., xxi, pp. 40, 94] remains a major problem in Maine. Between 1st January and the end of the 1940–1 season about 33 per cent. of the carload lots of potatoes examined at railway loading centres in Maine contained some ring rot. The only practical method of control is to eliminate all diseased seed stocks and plant only clean ones. Seed treatment for 5 minutes in a 1 in 500 acidulated mercurial dip containing 1 per cent. hydrochloric acid or 2 per cent. acetic acid gave excellent control against seed-piece contamination. For disinfecting storage bins, containers, and equipment, the coal tar disinfectants having a phenol coefficient of six appeared to be very effective, when used at a dilution of 1 qt. in 25 gals. of water. In varietal resistance tests some varieties showed no ring rot even two years after experimental inoculation.

Chemical studies by A. F. Ross on potato stem-end browning [ibid., xix, p. 492] showed that the necrotic areas of affected tubers contained 5 to 18·1 (average 11·2) p.p.m. of copper, as against 11·3 to 31·2 (average 20·1) p.p.m. of copper for corresponding parts of normal ones.

F. Upton and D. Folsom state that net necrosis [loc. cit.] was abundantly present in stored samples from two Green Mountain fields in which leaf roll had spread, while stem-end browning was common in stored samples from two Green Mountain fields where it had occurred before, provided the storage temperature was maintained at about 50° F. and that sufficient storage time had elapsed. There was less of either type of discoloration at 38°, 32°, and 60° than at 50°, and least of all at 32°. At the optimum temperature stem-end browning continued to increase until the middle of November, and net necrosis until some time in April. In November the warming-up of samples previously kept at inhibiting low temperatures induced net necrosis, but not stem-end browning. Relative humidity appeared to have no consistent effect on either condition.

D. Folsom isolated fungi and bacteria from stem-browning tubers from eight different sources. Of 80 tubers tested, 60 per cent. were sterile. Organisms isolated from the remainder were inoculated into the stem ends of recently dug Green Mountain tubers, which, however, developed less stem-browning than the controls.

G. W. Simpson, R. Bonde, W. F. Porter, and D. H. Perrin, describing the work of the foundation seed potato programme (started in 1939), state that 53 growers applied during the spring of 1940 for the roguing of about 237 acres of potatoes. Each plot was rogued a single row at a time at least once a week for six weeks. Seed was taken on all plots producing tubers with an average weight of 1 lb. per hill, the amount of seed required being obtained from plants whose tops were removed by pulling. Before the rest of a plot was dug a test sample was taken, grown in Florida and checked for disease content. Only stocks with not more than 1·5 per cent. total virus were accepted as of foundation standard. Observations in the Florida test plot made by G. W. Simpson, W. F. Porter, and D. H. Perrin showed that the samples ranged from 'no disease evident' to 68 per cent. total virus. The Chippewa variety had the highest disease content, with only 5 out of 28 samples qualifying, and Katahdin the lowest.

D'Angremond (A.). **Verslag van den Directeur van het Algemeen Proefstation der A.V.R.O.S. over het tijdvak 1 Januari 1937–31 December 1939.** [Report of the Director of the General Experiment Station of the A.V.R.O.S. for the period from 1st January, 1937, to 31st December, 1939.]—*Meded. alg. Proefst. Avros*, Alg. Ser., 59, 76 pp., [? 1940. Received May, 1942.]

The following items of phytopathological interest occur in the botanical section of this report (pp. 25–38). The white root fungus (*Rigidoporus microporus*) [*Fomes lignosus*] is the principal pathogen of the underground system of *Hevea* rubber in Sumatra [*R.A.M.*, xix, p. 44]. The use for interplanting of leguminous shrubs, such as lamtoro [*Leucaena glauca*], *Crotalaria*, *Tephrosia candida*, and *T. vogelii*, should be discouraged in cleared land, since their wide-spreading roots offer an easy foothold to the fungus and facilitate its further dissemination. In one plantation where both *T. candida* and *Derris elliptica* were used for interplanting, *F. lignosus* was found on the roots of both, killing those of the former but apparently not affecting those of the latter host. In another estate the roots and stumps were left in the ground after clearing operations. The white root fungus had never been observed in the old stand, but 1½ years after replanting, 20 per cent. of the trees were found to be infected.

Experiments in the preventive and curative treatment of root rot and patch canker (*Phytophthora*) of bud grafts, initiated in 1936, were concluded during the period under review. In the former series 100 trees of each of the clones AV 49, AV 152, and AV 163 were sprayed with various fungicides in March and April, 1936, and September, 1937, while 300 were left untreated as controls. Even in these the incidence of the disease was not high (7 per cent.), but within the limits thus imposed the best results were given by poliflor and lime-sulphur, of which the latter is to be preferred as three times cheaper than the former, two annual treatments costing Fl. 5 to 6 per ha. However, prophylactic measures against the form of *Phytophthora* under observation are only warranted where heavy infection is to be anticipated, since curative treatments can be given at a yearly cost of only about 60 cents per ha.

Suitable mixtures for the control of mouldy rot (*Ceratostomella fimbriata*) were found to consist of (*a*) 50 parts asphalt, 30 of petroleum, and 20 of Rütgers' non-emulsible carbolineum, and (*b*) 50 of special socony product 2295A, 30 of solar oil, and 20 of Rütgers' carbolineum; both socony product 2295A and petrolatum S642 B.P.M., which may be substituted for it if desired, are transparent vaseline preparations. However, the most effective of all mouldy rot disinfectants is a non-burning coal tar, and in this connexion mention is made of the necessity of testing each individual drum for the action of its contents on susceptible clones, e.g., AV 50 and 256.

Botryodiplodia theobromae was found in the dead tissues of bud grafts used as replacements; presumably the fungus entered the upper stem through the stump wound and occurred in a purely secondary capacity.

Stem rot (*F. noxius*) of oil palm [ibid., xvii, p. 301] was observed on one estate. *Poria ravenalae* [ibid., xvi, p. 656] is prevalent on dead leaf bases, but causes practically no damage to living palms. With the wide extension of oil palm cultivation during recent years the problem of crown disease [ibid., xv, p. 147] has again come to the fore. Since the cause of the trouble is unknown, no actual control measures can be suggested, but the following steps are recommended in plantings: (1) every six months (from the date of the first appearance of the disease) the leaf bases of affected palms should be marked with paint and all those with three marks (i.e., after a year's sickness) removed and replaced by healthy specimens; (2) direct substitution of sound for diseased palms. The former method is indicated where the number of available replacements is small or that of diseased palms large, while the latter may be adopted where the opposite conditions obtain.

Tea and the interplanted *L. glauca* on heavy forest soil were infected by *Rosellinia arcuata*, *R. bunodes*, and *F. noxius*, the first-named also attacking *T. candida* and *T. vogelii*. Grey blight (*Pestalozzia theae*) occurred in nursery beds and elsewhere, while one case only of *B. theobromae* on tea was reported, the latter organism also attacking *Albizzia* sp. [ibid., xvii, p. 301]. A fungus allied to *Rhizoctonia* [*Corticium*] *solani* infected *Centrosema pubescens*, inoculation experiments on which with the pathogen gave positive results. Improved drainage reduced the incidence of infection. *F. lignosus* was observed locally on gambir [*Uncaria gambier*] roots [ibid., ix, p. 126].

MÜLLER (A. S.). **El reconocimiento de las enfermedades de las plantas cultivadas en Venezuela, 1937–1941.** [Survey of diseases of cultivated plants in Venezuela, 1937–1941.]—*Bol. Soc. venez. Cien. nat.*, vii, 48, pp. 99–113, 1941.

The following are among the records of particular interest in this list of some 250 out of the 350 plant diseases collected and studied in Venezuela during the period from 1937 to 1941. Witches' broom of cacao (*Marasmius perniciosus*) [*R.A.M.*, xxi, p. 7] occurs in a very destructive form over a limited area nearest to Trinidad, while another case of an important pathogen involving only a restricted zone is represented by *Monilia roreri* [loc. cit.], which is found only along the river Catatumbo, Estado Zulia. Pod rots are caused by *Phytophthora palmivora* and *Diplodia cacaoicola* [*Botryodiplodia theobromae*]. Inadequately and excessively shaded coffee bushes are attacked by *Cercospora coffeicola* and *Omphalia flavida* [ibid., xiv, p. 397] respectively. Rice is commonly, but not severely, affected by *Piricularia oryzae*, *Entyloma oryzae*, and *C. oryzae*, while the damage to sugar-cane from the leaf spots *Leptosphaeria sacchari*, *C. longipes*, and *Helminthosporium stenospilum* [*Ophiobolus stenospilus*] is likewise slight. Mosaic is the most virulent disease of tobacco, and also attacks the tomato and chilli crops. *Phytomonas sepedonica* [*Bacterium sepedonicum*] is destructive on potatoes, especially in damp, low-lying situations. Streak and spindle tuber [ibid., xx, p. 221] are among the virus disorders of this crop. Leaf scorch of cucumbers is caused by *Peronoplasmopara* [*Pseudoperonospora*] *cubensis*. Bananas of the 'topocho' ['plump'] and 'manzano' ['apple'] types are threatened with extinction by *Bacillus* [*Bact.*] *solanacearum*, which in certain districts also attacks Gros Michel: other pathogens of the crop include *C. musae*, *Cordana* [*Scolecotrichum*] *musae*, *Stachylidium theobromae*, and *Gloeosporium musarum* (the principal agent of storage rot) [ibid., xix, p. 551 *et passim*], while the presence of *Fusarium oxysporum cubense* is suspected in one locality only. Papaw mosaic [ibid., xx, p. 565] is responsible for heavy losses, except in the Andes, *Colletotrichum papayae* [*C.? gloeosporioides*: ibid., xxi, p. 149] causes havoc in storage, and *Asperisporium caricae* [ibid., xxi, p. 88] is prevalent on the foliage. Among the citrus diseases may be mentioned foliar spotting due to *Septoria citri*, *Ascochyta citri*, and *C. gloeosporioides*, lemons and oranges being attacked by *Sphaceloma fawcettii* [*Elsinoe fawcetti*: ibid., xix, p. 366]. *Thielaviopsis* [*Ceratostomella*] *paradoxa* is the only important pathogen of pineapple. Fungi parasitic on the vine include *Cercospora viticola*, *S. ampelinum*, [*E. ampelina*], *Phakopsora vitis* [ibid., xv, p. 401], and *Guignardia bidwellii*.

Mosaic is the sole important gladiolus disease. Carnations suffer severely from rust (*Uromyces caryophyllinus*), and leaf spot (*Septoria dianthi*) is widespread. *Entyloma dahliae* is prevalent among garden dahlias, and *Pelargonium zonale* is frequently affected by foliar lesions due to *C. brunkii*. Powdery mildew of roses (*Oidium leuconium*) [*Sphaerotheca pannosa*] is severe throughout the year, while *Mycosphaerella rosicola* [ibid., xix, p. 348], *Actinonena* [*Diplocarpon*] *rosae*, *Sphaceloma rosarum* [ibid., xix, p. 366] and *Phragmidium subcorticium* [*P. mucronatum*] are also commonly encountered, the last-named in a severe form on certain varieties. Zinnias are attacked by *C. atricincta* [ibid., xvi, p. 128].

ELROD (R. P.). **Serological studies of Erwineae. II. Soft-rot group; with some biochemical considerations.**—*Bot. Gaz.*, ciii, 2, pp. 266–279, 1942.

Continuing his serological studies at the Ohio State University on the Erwineae [*R.A.M.*, xxi, p. 186], the writer tested in 26 fermentable substances 18 cultures of the four species comprising the soft-rot group [ibid., xxi, p. 42] from various sources, namely, five of *Erwinia aroideae*, three of *E. phytophthora*, two of *E. melonis*, two of *E. solanisapra* (one as *Bacillus atrosepticus*), and six of *E. carotovora* (two as *B. dissolvens*).

Classified on the basis of maltose fermentation, eight of the organisms fermented the sugar, six with both acid and gas formation and two with that of the former only, the maltose-negative cultures being correlated in 33·3 per cent. of the cases with maltose-negative antisera, while 28·6 per cent. of cross-reaction was demonstrated between the maltose-positive strains and the corresponding antisera. There was only 7·5 per cent. cross-reaction between the two fermentative groups, while the cross-agglutination experiments with 13 antisera were positive in 18·1 per cent. of the cultures, mostly within the same two groups. The correlation between maltose fermentation and serological groups would appear to support the contention, e.g., of Miss Lacey [ibid., v, p. 407] and Dowson [ibid., xx, p. 451], that two soft-rot pathogens exist, but the fermentative properties and antigenic structure of representatives of the two groups showed considerable variation.

Besides maltose, sorbitol was the only one of the substances used offering any possibilities of natural separation, and these seem to call for further investigation. It was broken down exclusively by the six cultures producing an abundance of gas. Stapp [ibid., viii, p. 397] obtained negative results in fermentation tests on sorbitol with strains of *E. phytophthora*, *E. carotovora*, and *E. solanisapra*.

The common antigenic components of the soft-rot group were shown to reside in the flagella. Adsorption experiments revealed a large number of flagellar components. The somatic fractions were found to be type-specific, though there was some evidence of common somatic factors. Like the somatic fractions, the carbohydrate materials extracted from the organisms proved to be type-specific, and the former are believed to owe their specificity to the latter.

BURKHOLDER (W. H.). **Three bacterial plant pathogens: Phytomonas caryophylli sp.n., Phytomonas alliicola sp.n., and Phytomonas manihotis (Arthaud-Berthet et Bondar) Viégas.**—*Phytopathology*, xxxii, 2, pp. 141–149, 1942.

Three bacterial plant pathogens are fully described: two are new, viz., *Phytomonas caryophylli* n.sp., the agent of a wilt and root rot of carnations in Washington State, and *P. alliicola* n.sp., causing onion bulb rot in New York State, while the third, *P. manihotis* (Arthaud-Berthet & Bondar) Viégas, responsible for cassava wilt in São Paulo, Brazil, has hitherto been reported, without adequate diagnoses, under various incorrect names, including *Bacillus manihot* Arthaud-Berthet, *B. manihotus* Arthaud-Berthet (the 'u', according to Viégas *in litt.* being a typographical error for 'i'), *B. manihoti* Berthet & Bondar, and *Bacterium manihotus* Drummond & Hipolito [*Ceres*, Minas Geraes, ii, 10 pp. 280–307, 11 pl., 1941].

P. caryophylli, the symptoms due to which may simulate those of *Fusarium* wilt [*F. dianthi*], is a Gram-negative rod, 1·05 to 3·18 by 0·35 to 0·95 (average 1·84 by 0·56) μ, actively motile by one to several flagella, frequently at both ends, forming on potato dextrose agar (the medium of choice) at 27° C. circular, smooth, glistening tan to grey-mauve, later brown colonies of a butyrous consistency; the minimum, optimum, and maximum temperatures for growth are 5°, 30° to 33°, and 46°; gelatine is slowly liquefied; indol and hydrogen sulphide are not produced; asparagin, potassium nitrate, and ammonium dihydrogen phosphate are utilized as sources of nitrogen; nitrates are reduced to nitrites; lipase is produced; carbon is supplied

by l-arabinose, d-xylose, rhamnose, dextrose, d-galactose, levulose, d-lactose, maltose, and sucrose, glycerol, mannitol, salicin, and the sodium salts of acetic, citric, formic, hippuric, lactic, maleic, malic, succinic, and tartaric acids; starch is not hydrolysed. These characteristics and the type of symptoms induced on the host leave little doubt that the causal organism differs from *P.* [*Bact.*] *woodsii* [ibid., xviii, pp. 413, 725], the only other bacterial pathogen known to attack the carnation. Inoculation experiments on Virginia carnations, *Dianthus barbatus*, and *D. allwoodii* gave positive results, *D. plumarius* remaining healthy.

The general appearance of the soft, water-soaked inner scales of onion bulbs infected by *P. alliicola* is not unlike that of those injured by frost; in the early stages of the disease the external aspect may be sound, but the microscopic examination of sections will reveal masses of bacteria. The organism is a Gram-negative rod, 1·05 to 2·8 by 0·7 to 1·4 (2·0 to 0·9) μ, with one to several flagella (sometimes bipolar), forming on beef extract-peptone agar at 27° white, later dirty colonies, with wavy edges of a viscid consistency, while the agar becomes a deep brown (not developed on potato dextrose agar); the minimum, optimum, and maximum temperatures for growth are 5°, 30°, and 41°; the biochemical characters resemble those of *P. caryophylli*, except that rhamnose is a poor source of carbon and maleic acid is not utilized for this purpose. Inoculation experiments resulted in a brownish rot of carrots, firmer than that caused by *Erwinia carotovora*, a limited black rot of paper-white *Narcissus* bulbs, and a slight dry rot of tulip bulbs and iris rhizomes. Unlike the bacteriologically similar *P.* [*Bact.*] *solanacearum*, the onion pathogen retains its virulence fairly well in culture; moreover, it does not attack potatoes, while onions appear to be immune from *Bact. solanacearum*: separation from an even more closely related organism, *P. gardeniae* Burkh. & Pirone, is indicated by the failure of *P. alliicola* to infect *Gardenia*. The pathogen probably belongs to the *Pseudomonas* group.

Phytomonas manihotis is a Gram-negative, probably non-motile rod, 1·4 to 2·8 by 0·35 to 0·93 (2·17 by 0·6) μ, showing in one culture a few cells with a single polar flagellum, forming on beef extract-peptone agar ivory-coloured, smooth, shiny, watery colonies, and on potato dextrose agar an abundant, white to hyaline, very mucoid growth; the minimum, optimum, and maximum temperatures for development are 5°, 30°, and 38°, respectively; gelatine is liquefied; hydrogen sulphide is formed but not indol; nitrogen is supplied by ammonium salts but not by nitrates or asparagin; very poor growth with slight acid production was obtained with dextrose d-galactose, levulose, d-xylose, maltose, and sucrose as sources of carbon, better results with an alkaline reaction being afforded by the salts of acetic, citric, malic, maleic, and succinic acids; starch is not hydrolysed. The exact taxonomic position of this organism calls for further studies.

KOEHLER (B.). **Effect of storage on yields of farm seed treated for disease control.**—*Bull. Ill. agric. Exp. Sta.* 476, pp. 259–276, 3 figs., 1941.

In experiments carried out in Illinois mainly to ascertain what adjustments are necessary in the dosage of mercurial disinfectants applied to cereal seed which is to be stored for different periods after treatment, $\frac{1}{4}$ oz. new improved ceresan applied two or more weeks before sowing gave at least as good control of loose and covered smuts of oats [*Ustilago avenae* and *U. kolleri*], barley scab and blight [*Gibberella saubinetii*], and wheat stinking smut [bunt: *Tilletia caries* and *T. foetida*] and at least as good yields of grain as $\frac{1}{2}$ oz. applied one day before sowing. The treated seed was stored for periods ranging from several hours to 67 days, and had a moisture content of under 13 per cent. while in storage.

In nine years' experiments with maize various organic mercury disinfectants were used, at the rate of $1\frac{1}{2}$ oz. per bush., and the periods of storage ranged from one day to one year. Some of the treated seed was stored with moisture contents of

17, 15, and 12 per cent. Contrary to the results with seed of small grain, seed maize was not damaged when the same rate of mercurial disinfectant was applied one year before sowing as was used when the treated seed was stored for one day. Maize from seed stored at 17 and 15 per cent. moisture gave yields inferior to those from seed stored at 12 per cent. moisture. This was true of both treated and untreated seed, indicating that the difference in yield was due to moisture effect only. New improved ceresan reduced to 1 per cent. ethyl mercury phosphate with maize starch gave results similar to those obtained with new improved semesan jr. Red copper oxide was slightly better than other disinfectants for protecting seed maize against soil-borne infection when the seed coat was broken, but it was rather less effective than some organic mercury disinfectants in controlling seedling blight due to *Diplodia* [*zeae*].

The following recommendations are made. Treated or not, small grains stored for seed purposes should not contain over 13 (preferably 12) per cent. moisture. New improved ceresan is recommended for wheat, oat, and barley seed. When the seed is to be stored for two weeks or more, only ¼ oz. should be used per bush. Wheat seed darkened by bunt and not re-cleaned before treatment requires ½ oz., even if the disinfectant is applied several weeks before planting; if treatment is effected a day or two before planting 1 oz. should be used.

Copper carbonate (2 to 3 oz. per bush.), basic copper sulphate (2 oz.), and red copper oxide (1½ oz.) give good control of seed-borne diseases of wheat, and of hull-less oats and barley. The full dosage must be used whether the grain is to be stored or not.

Against maize seedling diseases new improved semesan jr and barbak-C are recommended. The treated seed can safely be stored for six months to a year, provided the moisture content is not too high and the seed is protected against high atmospheric humidity. Mercurial disinfectants should not be used in excess of an amount that will adhere to the seed maize, usually about 1½ oz. per bush.

Mundkur (B. B.), Pal (B. P.), & Bose (R. D.). **Studies in Indian cereal smuts. II. Varietal resistance of Indian and other Wheats to loose smut. III. Varietal resistance of Indian and other Wheats to flag smut. IV. Varietal resistance of Indian and other Oats to smuts.**—*Indian J. agric. Sci.*, xi, 5, pp. 675–702, 1 pl., 1 fig., 1941.

In continuation of their initial studies on the principles underlying the breeding of cereals for smut resistance in India [*R.A.M.*, xviii, p. 585], Mundkur and Pal report and tabulate the results obtained to date in the development of wheat varieties resistant to loose smut (*Ustilago tritici*) and of varieties resistant to flag smut (*Urocystis tritici*), and Bose and Mundkur of oats resistant to loose and covered smuts (*Ustilago avenae* and *U. kolleri*).

Loose smut of wheat is controllable by the hot-water treatment, involving four hours' immersion at 26° to 27° C., followed by ten minutes at 53° to 54°, but since this method is apt to impair the viability of the seed-grain, preference should be given to the development of resistant varieties. Each of the 97 varieties tested for this purpose from 1936 to 1940, first at Pusa and then at New Delhi, was inoculated by M. B. Moore's method with a spore suspension *in vacuo* [ibid., xv, p. 567]. Throughout the trials three stocks of the Australian variety Federation and two of its hybrids, I(mperial) P(usa) 114 and IP 124, remained immune, while other crosses of mixed Australian and Indian parentage were highly resistant, including IP 120, 121, 122, and 165. Selection within several semi-susceptible varieties, e.g., IP 120 and 121, resulted in the production of highly resistant or immune segregates, but similar attempts with highly susceptible but economically valuable varieties were unsuccessful.

Ninety-seven Indian and other wheat varieties were inoculated by a method entailing the contamination both of the soil and of the seed-grain with *Urocystis tritici*,

which is prevalent in parts of the Punjab, the North-West Frontier Province, Baluchistan, and southern Afghanistan, causing substantial reductions of yield and decreasing the germinability of the seed by up to 63·7 per cent. During the three years of the trials (1938 to 1940), six varieties remained completely immune from flag smut, viz., 111–2–6, 111–2–8, 111–2–9, Geerlying, German, and Hornblende, while a number of others,including IP 4, IP 111, 111–2–3, 111–2–4, Sword, Igachikugo, Dundee, Baringa, Genoa, Peragis, Florence, and C5271–W1 showed a high degree of resistance, with only 0·4 to 1·8 per cent. mild infection.

The outcome of these experiments is considered to afford some indication of physiologic specialization in *U. tritici* [cf. ibid., xviii, p. 169]. Thus, Pridham and Dwyer found the Ranee and Florence varieties susceptible in Australia [ibid., ix, p. 770], Baringa and Gullen being classified as moderately resistant: at New Delhi all four varieties contracted only 1 to 2 per cent. infection. On the other hand, Nawaba and Ford, which were extremely resistant in Australia, developed 3·7 and 7·4 per cent. infection, respectively, in the Indian tests, while Firbank, resistant in Pridham and Dwyer's trials, showed 9 per cent. flag smut in the authors'. Hence it would appear that the Australian and Punjab races of the smut are distinct.

Ustilago kolleri is stated to be much more widely distributed on oats in India than *U. avenae* [ibid., xiv, p. 160]. Both smuts are amenable to seed treatment, particularly good results having been obtained in the case of the former by the formalin dry spray method [loc. cit.]. However, the resistance of certain varieties to *U. kolleri* observed in the course of breeding work led to a study on the nature of this reaction, involving a series of experiments initiated at Pusa in 1932–3 and concluded at New Delhi in 1938–9, in which attention was chiefly directed to covered smut as the more important of the two. The rapid loss of germinability in *U. kolleri* after the fourth month may be prevented by wrapping the smutted ears in blotting paper and storing them at a temperature of 12°. The seeds of all the 60 Indian and foreign varieties included in the tests were dehulled before inoculation, which was carried out four days previous to sowing. In 1932–3 nearly all the foreign varieties were immune or virtually so, whereas in 1935–6 only five (Kinwada S10, Nebraska 21, Iowar 670, Gopher, and Kanota), in 1936–7 three (Kinwada S10, Nebraska 21, and Gopher), and in 1938–9 two (Abundance and Gopher) remained free from infection. Of the hybrids between Indian and foreign varieties, I–207–95 was immune in 1935–6 and 1936–7 and showed 0·7 per cent. infection in 1938–9, the corresponding figures for VII–408 being 0, 0·7, and 0, respectively. The erratic germination of the spores in 1933–4, 1934–5, and 1937–8 precluded the tabulation of experimental data. The physiologic race of *U. kolleri* used in these tests was determined by G. M. Reed as a new one, to which he has assigned the number 14.

In 1928–9 the incidence of *U. avenae* on uninfected seed sown dry of IP 1, IP 2, Pusa Farm, and Lyallpur was 0, 0·7, 0, and 7·6 per cent., respectively, the corresponding figures for seed soaked in water for two hours being 0·1, 11·6, 0·4, and 40·8 per cent., respectively, and for that immersed in a heavy aqueous suspension of spores for the same period 0·1, 14·5, 0·5, and 45 per cent., respectively. In 1929–30, ordinary seed of IP 1 and Lyallpur contracted 0·05 and 1·3 per cent. infection, respectively, the same soaked in water for two hours 0·65 and 22·5 per cent., respectively, seed inoculated before storage and sown dry 19·41 and 34·4 per cent., respectively, the same sown after two hours' immersion in water 66·9 and 78·1 per cent., respectively, seed inoculated with dry spores before sowing 18·2 and 25·7 per cent., respectively, and seed inoculated before sowing by a two-hour soak in an aqueous spore suspension 51·1 and 91·3 per cent., respectively. It is apparent from these results that the inoculation of hulled seed before storage and its immersion prior to sowing ensure adequate infection, but the most uniformly successful method consists in removing the hulls, smearing the seeds with spores, and germinating them in moist sand at a suitable temperature.

RODENHISER (H. A.) & HOLTON (C. S.). **Variability in reaction of Wheat differential varieties to physiologic races of Tilletia levis and T. tritici.**—*Phytopathology*, xxxii, 2, pp. 158–164, 1942.

A tabulated account is given of a series of trials, carried out at seven agricultural experiment stations from 1937 to 1939, to determine the range of variability in the reaction of the differential spring wheats, Ulka, Marquis, and Canus, to physiologic races L 1, 2, 3, 4, 5, 7, and 8 of *Tilletia levis* [*T. foetida*] and T 3, 4, 5, 7, 8, 9, and 10 of *T. tritici* [*T. caries*: *R.A.M.*, xvii, p. 164 and preceding abstract]. Ulka gave a uniformly susceptible response to all the races at each of the stations throughout the period of the tests, whereas the reactions of Marquis were so variable under differing environmental conditions (apart from the consistent resistance of spring sowings to T 9) that it would be classed as resistant, intermediate, or susceptible to the particular races concerned according to the locality. Canus varied in its reactions to the races to which it is susceptible, but maintained a uniform resistance to L 1, L 2, and L 4, at all the spring wheat stations.

It is believed that variations in environmental conditions modify the expression of genetic factors for the protoplasmic reactions of the host in diverse ways; in other words, the plant, rather than the pathogen, is the first to respond to external influences. The numerous inconsistencies exhibited by two of the three varieties tested exemplify the complexity of race identification and add to the difficulty of assessing bunt resistance in spring wheats. It is apparent from the data here presented that trials for varietal reaction should not be confined to a single station, since a given race may appear innocuous under the optimum conditions for infection prevailing, for instance at Aberdeen, Idaho, and assume major importance in another environment. Such was the case in 1938 with L 2, L 4, and T 7 on Canus and T 9 on Marquis which showed an average of 0·7, 0·2, 6·3, and 4·7 per cent. infection, respectively, by these races at all the spring wheat stations compared with 27, 12, 52, and 58 per cent., respectively, in autumn sowings at Pendleton, Oregon.

HAYES (H. K.). **Barley varieties registered, VII.**—*J. Amer. Soc. Agron.*, xxxiv, 3, pp. 281–282, 1942.

Of the three barley varieties approved for registration [cf. *R.A.M.*, xx, p. 356] in 1940, viz., Beecher, Reg. No. 12, Lico, Reg. No. 13, and Texan, Reg. No. 14, the last-named, developed from a selection from Composite Cross C.I. 5530 of winter barley made in 1933, is resistant to mildew [*Erysiphe graminis*] and moderately so to net blotch [*Helminthosporium teres*] in the field.

STANTON (T. R.) & MURPHY (H. C.). **Field studies of smut resistance in Oats.**—*J. Amer. Soc. Agron.*, xxxiv, 3, pp. 248–258, 1942.

Uniform tests of oats for resistance to loose and covered smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]) were conducted in various parts of the United States from 1935 to 1939, at nine experiment stations in the first year and at 13 to 15 in the four following, local collections of the pathogens being used at each nursery [*R.A.M.*, xxi, p. 251].

The Canadian and Gothland controls proved highly susceptible to nearly all the strains included in the tests, with averages of 73·86 and 36·92 per cent., respectively, the corresponding figures for the other check varieties, Richland, Monarch, Black Mesdag, Fulghum, and Red Rustproof (Appler), being 20·89, 19·93, 3·44, 13·39, and 0·56 per cent., respectively. Navarro C.I. 966 and Victoria C.I. No. 3531, tested for four and five years, respectively, remained free from infection throughout the trials, while a further 23 out of the 68 varieties and selections regarded as smut-resistant proved immune in all the years in which they were included. Generally speaking, the incidence of infection was low for all varieties during the period covered by the experiments, only 18 showing an average above 1 per cent. Of the various groups

of selections, that from the Victoria × Richland was the most resistant, while the Bond crosses were the most susceptible within the resistant category. Bond itself showed a certain amount of infection in each of the five years (average 1·12 per cent.), due to its susceptibility to the physiologic races attacking the Red Rustproof strains. Markton was free from smut in four out of the five years, the average of 1·68 per cent. in 1935 being attributed to mechanical admixtures.

STANTON (T. R.). **Registration of varieties and strains of Oats. XI.**—*J. Amer. Soc. Agron.*, xxxiv, 3, pp. 275–279, 1942.

Full particulars are given of three additional varieties of oats approved for registration since the publication of the previous list in March, 1941 [*R.A.M.*, xx, p. 357], viz., Otoe (early red) Reg. No. 98, Tama (early yellow) Reg. No. 99, and Marida (mid-season white) Reg. No. 100. Otoe is resistant to stem rust [*Puccinia graminis*], Tama to nearly all the physiologic races of crown rust [*P. coronata*], *P. graminis*, and the smuts [*Ustilago avenae* and *U. kolleri*], and Marida to most of the physiologic races of the smuts occurring in the north-west of the United States.

STEVENS (N. E.). **How plant breeding programs complicate plant disease problems.**—*Science*, N.S., cxv, 2465, pp. 313–316, 1942.

The author discusses, and illustrates by some striking concrete examples, the risks of extensive plant disease dissemination attendant on the now established practice of breeding for resistance to certain pathogens of economic importance. In his opinion it is impossible to test new varieties sufficiently to make sure that some of them will not prove very susceptible to some disease later on. The real test of a new variety can only be its culture in the hands of 10,000 to 20,000 farmers. In considering future possibilities regarding plant diseases in maize, notably the plastic bacterial wilt [*Aplanobacter stewarti*] with its many strains, and the very variable smut [*Ustilago zeae*], the author draws attention to the very general planting of hybrid maize, the acreage under which in 1939 was computed by H. A. Wallace (*New Repub.*, 8th November, 1939) at a minimum of 25,000,000, compared with 500,000 in 1935. In Maryland, for instance, Golden Cross Bantam (a composite of two inbred lines, Purdue 39 and 51) furnished 40 per cent. of the total canning crop, and the quantity of seed of this variety produced in 1937 amounted to 1,500,000 lb., as against 2,000 in 1932. Through such intensive selection the indigenous 'Indian corn' is undergoing gradual conversion from a freely cross-pollinated crop, with an almost unlimited capacity for adjustment to pathogenic organisms, into a synthetic product deprived of its natural powers of adjusting itself by continual crossing and variation to the variable parasites attacking it. The writer anticipates the development in hybrid maize of a disease relation approximating to that obtaining in wheat and involving wider fluctuations in losses than have hitherto been in the former crop.

STEVENS (N. E.) & CHAPMAN (R. A.). **Growth of Diplodia macrospora in media containing pure biotin.**—*Phytopathology*, xxxii, 2, p. 184, 1942.

The writers have recently found that the addition to the basal medium of pure crystalline biotin-methyl ester promotes the growth of the maize ear pathogen *Diplodia macrospora* [*R.A.M.*, xxi, p. 285], the optimum dosage being at the rate of 2 γ per l., though some development occurred in the presence of only 0·5 γ.

ELLIOTT (CHARLOTTE). **Bacterial wilt of Dent Corn inbreds.**—*Phytopathology*, xxxii, 3, pp. 262–265, 1942.

A tabulated account is given of a series of inoculation tests at the Arlington Experiment Farm, Virginia, in 1939 and 1940 to determine the reaction to bacterial wilt (*Xanthomonas stewarti*) of 50 dent maize hybrids, with special reference to the

late leaf blight phase of the disease which is responsible for such heavy losses (up to 50 per cent.) in susceptible lines, besides enhancing their liability to stem rot (*Diplodia*) [*zeae*: *R.A.M.*, xii, p. 364]. With one exception all the inbreds were more susceptible to leaf blight with advancing maturity than to stalk injections with an aqueous suspension of three virulent cultures of the pathogen, to which at least 12 were very resistant and a number of others moderately so in both seasons. Seedling reaction to invasion by *X. stewarti* is not, therefore, a safe guide to the subsequent behaviour of the same lines at a later stage of growth. Field observations on resistance in 1939 and 1940 showed that the incidence of wilt among 15,000 dent seedlings in the former season amounted to only 1·5 per cent. compared with 27 per cent. in the sweet lines, the corresponding figures for 12,000 plants in the latter year being 0·7 and 35 to 46 per cent., respectively. The differences in the resistance of dent inbreds offer promising possibilities for the development of a corresponding character in hybrids of the same type, a matter of great importance, since selection along these lines is the only known method of combating the disease in its later stages.

Fruit and vegetable protection.—*Food Manuf.*, xvii, 4, p. 105, 1942.

A new synthetic wrapper for fruits and vegetables, known as 'pliofilm' and made of rubber hydrochloride, has been under investigation for some years at the Florida Agricultural Experiment Station, where it is reported to have given excellent control of fruit and vegetable storage disorders, including citrus stem-end rot [*Diplodia natalensis*], besides imparting a brilliant gloss to the fruit, preserving its vitamin C content, and reducing its moisture loss to 1 per cent. over several months' storage, compared with 10 per cent. for ordinary tissue wrappers under identical temperature and humidity conditions. By means of a special stretching process the wrap is fitted skin-tight to the fruit, thereby reducing both the amount and the cost of the material required. Up to 500 fruits can be wrapped per minute. The many advantages of 'pliofilm' (a report on which is expected from the Station) should more than offset the slight additional expense of the treatment.

Menon (S. K. R.). **Notes on the fall of immature Coconuts in Ceylon.**—*J. Coconut Ind.*, v, 3, pp. 87, 89–91, 1941.

Among the factors—physiological, meteorological, pathological, genetical, and predatory—contributing to the fall of immature coco-nuts in Ceylon may be mentioned the disease caused by *Phytophthora* [*palmivora*: *R.A.M.*, xii, p. 77], which is stated to occur in a chronic form in certain districts with a heavy rainfall, e.g., Kurunegala, Bingiriya, and Mawatagama. On the Denever estate of Messrs. Harrison & Crosfield, Ltd., in the last-named region, for instance, all attempts at control have proved unavailing, and visitors are astonished at the vitality and fecundity of the palms notwithstanding years of depredation by the pathogen.

Ray (W. W.) & McLaughlin (J. H.). **Isolation and infection tests with seed- and soil-borne Cotton pathogens.**—*Phytopathology*, xxxii, 3, pp. 233–238, 1942.

Particulars are given of a series of greenhouse tests conducted at the Oklahoma Agricultural Experiment Station to determine the relative pathogenicity of a number of seed- and soil-borne fungi to three cotton varieties, viz., Acala (1938 Oklahoma crop), Paymaster (1939 Texas), and D. and P.L.11A (1938 Mississippi), the organisms being inoculated into (*a*) sterile soil (2 parts loam, and one each of sand and sewer sludge) in which sterile seed was subsequently planted, and (*b*) cotton seedlings grown under sterile conditions in test tubes on water agar. The data were collected at the end of 28 days in most of the trials.

At an average temperature of 80° F. and with an ample water supply for the plants, the four most virulent pathogens were *Glomerella gossypii*, *Rhizoctonia* [*Corticium*] *solani*, *Fusarium scirpi*, and *F. moniliforme* [*Gibberella fujikuroi*] in the order

named [*R.A.M.*, xxi, p. 196]. In the excessively humid atmosphere induced by heavy and repeated watering (several times daily) at a temperature of 80°, all the organisms tested, especially *G. fujikuroi*, acquired an access of virulence, with the exception of *F. vasinfectum*. Conversely, a decline in pathogenicity was manifested by most of the fungi, excepting *Glomerella gossypii*, *C. solani*, and *F. scirpi*, in soils kept only just moist enough to maintain the growth of the seedlings. Plants transferred to the open (65°) after several days at 80° were severely attacked by *C. solani* and *F. scirpi*, the other fungi causing no serious injury under these conditions. *G. gossypii* and *C. solani* were responsible for considerable damping-off in soils rendered alkaline (P_H 8·3) by the addition of lime, and were also injurious in those with an acid reaction (6·3) due to the incorporation of sulphur.

Since *G. gossypii* was shown to have the heaviest infection index (obtained by multiplying the percentage of severely diseased plants in each by three, moderately infected by two, and slightly attacked by one, totalling, and averaging), it was given an arbitrary weighted index of 100, the proportions to which of the other fungi concerned were as follows: *C. solani* 86, *F. scirpi* (isolate D) and its var. *acuminatum* 58 and 56, respectively, *F. chlamydosporum* [ibid., xiii, p. 593] 53, *G. fujikuroi* (isolate 110) 52, *F. vasinfectum* (27) 48, *F. scirpi* (44A) 47, *F. solani* 46, *F. equiseti* var. *bullatum* 46, *Sclerotium bataticola* (41) [*Macrophomina phaseoli*: ibid., xviii, pp. 25, 286] 45, *F. semitectum* 42, *G. fujikuroi* (115) 40, *F. vasinfectum* (24) 37, *G. fujikuroi* (18) 35, *F. vasinfectum* (27) 34, and *M. phaseoli* (R 37) 30. Of all these fungi *C. solani* is regarded as the most injurious to cotton seedlings in Oklahoma, where it is widely distributed in the soil, and (as also shown by Lehman in North Carolina) [ibid., xx, p. 60] very difficult to control.

Sokoloff (V. P.) & Klotz (L. J.). **Mortality of the red scale on Citrus through infection with a spore-forming bacterium.**—*Phytopathology*, xxxii, 3, pp. 187–198, 3 figs., 1942.

A denitrifying bacillus, apparently distinct from all other known micro-organisms and herein designated *Bacillus* C, was experimentally shown in the laboratory of the Citrus Experiment Station, Riverside, California, to be capable of invading and destroying adult red scales (*Aonidiella aurantii*) on lemons. The newly discovered organism is a Gram-positive, strictly aerobic, pluriflagellate rod, 6 by $1\frac{1}{4}$ μ, forming spores in the equatorial position and bearing a certain resemblance to Dutky's Japanese beetle (*Popillia japonica*) pathogens [*B. popilliae* and *B. lentimorbus*: *R.A.M.*, xxi, p. 78]; it occurs singly and in pairs or chains and generally loses its motility after a few days on standard media; on aerobic plates growth was made from P_H 4 to 9·5 and in liquid substrata from 6 to 9·3, with an optimum at 7·5, the optimum temperature for development in chitin suspensions being 30° C., with a range from 12° to 40°. *Bacillus* C was originally isolated from the soil. Mass infection of the insects, with 98 per cent. mortality, was secured by a minimum of 2 to 4, and preferably 16, hours' immersion of the fruits in the beakers containing either peptone-water cultures or suspensions of the bacillus in sterile tap water. The destruction of the scales was found to be accompanied by a significant reduction in their soluble nitrate content, to which the lethal action of the bacillus may conceivably be related.

Harrar (J. G.) & McKelvey (J. J.). **Biological control of the Mealy Bug (Pseudococcus spp.).**—Abs. in *Phytopathology*, xxxii, 1, p. 7, 1942.

Highly satisfactory results have been obtained in laboratory and greenhouse experiments in the control of mealy bugs (*Pseudococcus* spp.) through the agency of a virulent, specific fungal pathogen, for which the name *Endosclerotium pseudococcia* is proposed [without a diagnosis], while observations in apple orchards also indicate a potentially high mortality from the same source. Evidence was obtained that the

fungus can destroy mealy bugs at all stages of development except the egg. Under unfavourable environmental conditions it produces highly resistant compound sclerotia, which remain viable for several months and are responsible for the persistence of the pathogen in the greenhouse and field.

HEIM (R.). **Observations sur la flore mycologique malgache. VI. Les champignons des Termitières. Première note: Basidiomycètes.** [Observations on the mycological flora of Madagascar. VI. The fungi of Termites' nests. First note: Basidiomycetes.]—*Bol. Soc. broteriana*, Ser. 2a, xiii (*1938–1939*), pp. 45–68, 2 pl., 6 figs., [? 1939].

An annotated list is given of eight Basidiomycetes found associated with termites' nests in Madagascar [cf. *R.A.M.*, xix, p. 405]. The author has limited his observations strictly to the taxonomic aspect of the species concerned, without entering into the problem of their biological relationships with the insects.

EMMONS (C. W.). **Medical mycology in Latin America.**—*Chron. bot.*, vii, 1, pp. 15–16, 1942.

The large medical centres of South America, where the relation of fungi to human disease has long been studied with interest, have furnished a steady flow of valuable contributions to the knowledge of mycoses of various types, some of the more important of which are here briefly outlined. Most of the recent investigations mentioned have been noticed in this *Review*.

EMMONS (C. W.). **The isolation of Coccidioides from soil and from rodents.**—*Publ. Hlth Rep., Wash.*, lvii, 4, pp. 109–111, 1942.

During the summer of 1941 *Coccidioides immitis* was isolated from five out of 150 soil samples collected in the desert near the village of San Carlos, Arizona, following J. D. Aronson's demonstration (in a paper in the press) that a very high percentage of native schoolchildren on the local Indian reservation were sensitized to coccidioidin. No human case of the disease caused by the fungus having been diagnosed locally and its rarity as a soil saprophyte established, a search for an animal reservoir appeared to be indicated. The susceptibility of deer mice (*Peromyscus*) to *C. immitis* having been demonstrated in laboratory experiments by the writer, 105 wild rodents were trapped in the locality, of which species of *Perognathus* appear to be the predominant hosts; their role in relation to the spread of infection remains for discussion in a subsequent paper.

NEGRONI (P.). **Mykologisches Studium des ersten südamerikanischen Falles von Histoplasmosis.** [A mycological study of the first South American case of histoplasmosis.]—*Rev. Inst. bact., B. Aires*, ix, pp. 239–294, 1940. [Abs. in *Zbl. Bakt.*, Abt. 1 (Ref.), cxl, 11–12, pp. 235–236, 1941.]

The cultural and morphological characters of a strain of *Histoplasma capsulatum* isolated from ulcers in a fatal case of histoplasmosis (the first in South America) during the patient's lifetime [*R.A.M.*, xxi, p. 290] are fully described.

DEY (N. C.). **Notes on common skin diseases. III. Ringworm of the scalp: favus.**—*Indian med. Gaz.*, lxxvi, 7, pp. 416–417, 1941.

Favus (*Achorion schoenleini* and *A. actoni*) [*R.A.M.*, xv, p. 579] is stated to be endemic in Kashmir, the Punjab, the North-West Frontier Province, and Rajputana, but seldom occurs in the eastern and southern parts of India. The disorder is mostly restricted to the lower classes: its symptoms are described and therapeutic methods briefly discussed.

Rávnay-Preininger (T.). **Dermatomykosen.** [Dermatomycoses].—*Dermatologica* (formerly *Derm. Z.*), lxxxiv, 1–2, pp. 85–105, 1941.

This is a review, supplemented by bibliographical references, of outstanding recent contributions from various countries to the elucidation of different aspects of human dermatomycoses.

Morrison (H. B.) & Hill (H. W.). **Observations on the rate of growth of Oospora lactis.**—Abs. in *J. Bact.*, xliii, 2, p. 271, 1942.

Butter containing an unduly large number of mycelial fragments of the milk mould, *Oospora lactis* [*R.A.M.*, xxi, p. 17], being subject to rejection under the regulations of the United States Drug and Food Administration, information concerning the rate of growth of the organism is of importance to cream- and butter-producers.

In a study at the Kentucky Agricultural Experiment Station the average time at room temperature for the production by ten colonies (each grown from a single spore) of 100 μ of mycelium was 10·71 hours, the corresponding periods for 500 and 1,000 μ being 14·21 and 15·28 hours, respectively, with time ranges for the three mycelial lengths of 5·6 to 17·1, 7·95 to 21·35, and 8·9 to 23·2 hours, respectively. At a temperature of 58° F. the periods required for the attainment by the mycelium of lengths of 100, 500, and 1,000 μ were 44·3, 59, and 65·7 hours, respectively, but after a length of 600 μ was reached, growth was almost as rapid as at 70° to 75°.

Logarithms of mycelial length plotted against time gave an almost straight line, indicating that the increase in protoplasm in colonies of *O. lactis* proceeds at a rate approximating to that obtaining in bacterial populations and other biological growth.

Lagoni (H.). **Vergleichende Untersuchungen über den mikrobiciden Effekt verschiedener Konservierungsmittel.** [Comparative studies on the microbicidal effect of various preservatives.]—*Zbl. Bakt.*, Abt. 2, ciii, 9–11, pp. 225–231, 1 graph, 1941.

The results of trials at the Prussian Dairy Experiment and Research Institute, Kiel, showed that the inhibitory action of diacetyl on nutrient agar cultures of various organisms responsible for butter and margarine spoilage, including *Candida albicans*, *Penicillium commune*, *Fusarium lactis*, and *Oospora lactis* [see preceding abstract], was almost as powerful as that of benzoic acid [*R.A.M.*, xii, p. 524 *et passim*], whereas sodium benzoate [ibid., xxi, p. 80] was less effective. In most cases a concentration of diacetyl of m/500 sufficed to eliminate the contaminants, *C. albicans* and *P. commune*, however, being more refractory and requiring a dosage of m/100 to produce comparable effects.

Baylis (G. T. S.). **Stem-break and browning (Polyspora lini) of flax in New Zealand.**—*N.Z. J. Sci. Tech.*, A, xxiii, 1, pp. 1–8, 4 figs., 1941.

During flax crop surveys in the Canterbury district of New Zealand in 1939 and 1940, the stem-break and browning disease caused by *Polyspora lini* (identified by J. Colhoun from a culture sent to Northern Ireland) was observed for the first time in the country, both oil- and fibre-yielding varieties being affected [*R.A.M.*, xix, pp. 643, 644].

Traces of the fungus had been detected in the seed of Liral Crown linen flax from North Canterbury and Marlborough in 1938 (A. E. Muskett's determination), though no symptoms were apparent in the crop. In the following year the Marlborough stands again presented a healthy aspect, but 11 out of the 28 in North Canterbury were attacked, and the post-harvest examination of seed samples revealed infection in eight additional lines. The damage caused by the disease was not severe. In varietal reaction tests at Lincoln three large-seeded selections of the oil-yielding Moose (13/28, 16/28, and 11/29) proved resistant, while Rio was apparently immune. The most susceptible varieties were the blue-flowered fibre-producing Liral Crown,

Stormont Cirrus, and Stormont Gossamer. Seed-borne infection was entirely eliminated by ten minutes' immersion of the seed in water heated to 126° F., the swelling of the mucilaginous coating liable to occur during this process being much reduced by the addition of 5 per cent. alum and entirely obviated by freely dusting the seed with hydrated lime and mixing 1 per cent. of the same with the steep.

Linn (M. B.). **Cephalosporium leaf spot of Dieffenbachia.**—*Phytopathology*, xxxii, 2, pp. 172–175, 1 fig., 1942.

A species of *Cephalosporium* responsible for a leaf spot prevalent on greenhouse plants of *Dieffenbachia picta* on Staten Island, New York, is described [without a Latin diagnosis] as *C. dieffenbachiae* n.sp. It is characterized on potato dextrose agar by a creeping, appressed, pulverulent, white, later cartridge-buff mycelium, composed of septate, branching hyphae, 2 to 4 μ in diameter; simple to one- or two-branched, continuous to septate, mostly straight conidiophores, 4 to 47 by 1·5 to 2 μ, bearing acrogenously hyaline, ovoid to short-cylindrical, uni- to bi-, rarely tri- or quadriseptate conidia, 3 to 12·5 by 1·5 to 2·5 μ, collecting in greyish-white, shiny, spherical heads, 5 to 12 μ in diameter. The fungus produces on the leaves greyish lesions with dark brown borders, mostly circular at an advanced stage of infection, when a diameter of 6 to 8 mm. may be attained. Elongated spots may occasionally be observed on the petioles, midribs, and stems under conditions specially conducive to the development of the pathogen, the initial invasion of which is effected through wounds, mostly inflicted by mealy bugs, on the young, convolute leaves. *C. dieffenbachiae* differs from *C. cinnamomeum* [*R.A.M.*, xx, p. 305] in morphological and cultural characters, and moreover, cross-inoculation experiments with the two species showed the former species to be non-pathogenic to *Nephthytis afzelii* (the host of the latter), while *C. cinnamomeum* failed to infect *D. picta*.

Weiss (F.), Haasis (F. A.), & Williamson (C. E.). **Prestorage disinfection of Narcissus bulbs.**—*Phytopathology*, xxxii, 3, pp. 199–205, 1942.

Of the various fungicides so far tested for the control of basal rot of King Alfred narcissus [daffodil: *Narcissus pseudonarcissus*] bulbs (*Fusarium bulbigenum*) [*R.A.M.*, xix, p. 539] on Long Island, New York, the most effective are two mercury compounds, mercuric chloride plus 1 per cent. acetic acid (ethyl mercury chloride) and ethyl mercury phosphate (new improved ceresan) used at concentrations of 0·2 and 0·4 per cent., respectively, the former reducing the number of rotten bulbs (per unit sample of 50) after about two months' storage from 19·50 in the untreated controls to 7·50 and 7·75 in two lots (5 and 15 minutes' immersion, respectively), and the latter to 5·50 and 3·25 (2 and 5 minutes, respectively). The rot was better combated by treatments applied shortly after digging than by those delayed for longer periods, the protective action of new improved ceresan being practically lost after 15 days (22·25 diseased bulbs out of 50 compared with 5·17 in a batch disinfected three days after harvesting). On the other hand, the early treatments caused floral disfigurement, the incidence of which amounted to 90·4 per cent. in batches disinfected with new improved ceresan three days after digging, as against 0·7 per cent. after a 15 days' delay. Experiments are now in progress to secure a practicable compromise between the conflicting requirements of adequate control of the fungus and elimination of injury to the flowers.

Jenkins (Anna E.). **Ascochyta majalis identified on Lily of the Valley in the United States.**—*Phytopathology*, xxxii, 3, pp. 259–261, 1 fig., 1942.

This is an expanded account of the writer's recognition in 1940, for the first time in the United States, of the lily of the valley disease caused by *Ascochyta majalis*, a note on which has already appeared [*R.A.M.*, xx, p. 208]. The spots scattered over the blade were elliptical or elongated, up to 2 cm. in length, Hessian brown (Ridgway)

on the dry specimen, sometimes with a purple margin, which in turn was usually surrounded by a somewhat indefinite bright green zone. The spherical to flattened pycnidia, strewn over the surface of the lesions and occupying almost the entire thickness of the leaf, bore bi- to tri- or quadricellular yellowish conidia with sticky walls. The fungus was grown in pure culture on potato dextrose agar. A comparison of the American and Italian (type) material of *A. majalis* revealed their complete identity. In one case part of a discoloured area on a leaf base gave rise in culture to an organism believed to be *Kabatiella microsticta*, previously reported on the same host from the United States [ibid., viii, p. 725] and Czechoslovakia, while it may also have been responsible for a lily of the valley disease in Germany attributed by Pape to a *Gloeosporium* [ibid., vi, p. 730].

Weston (W. H.). **The conidial phase of Sclerospora noblei.**—*Phytopathology*, xxxii 3, pp. 206–213, 1 fig., 1942.

The author's original diagnosis of the distinctive oogonial stage of *Sclerospora noblei*, a destructive parasite of the valuable native perennial fodder grass, *Andropogon australis*, in New South Wales [*R.A.M.*, ix, p. 320], is here supplemented by a technical diagnosis and discussion of the conidial phase, which has since been collected by R. J. Noble on successively unfolding leaves bearing pallid, linear streaks during the months of December, January, and February.

The well-developed, arbusculate conidiophores, 300 to 450 μ in height, are furnished with a basal cell, 68 to 110 by 8 to 13 (usually 90 by 10) μ, exclusive of which the main axis measures 120 to 200 (170, not counting the basal cell) by 20 to 34 (usually 28) μ and produces two to four, ordinarily three, large primary branches, giving rise to secondary, tertiary, or rarely quaternary ones, terminating in tapering sterigmata 10 to 15 μ long, which bear hyaline, obovoid conidia, 21 to 38·9 by 13 to 30·9 (25 to 32·9 by 19 to 22·9) μ. These features relate *S. noblei* to the predominantly conidial species of the Orient, and place it in a position intermediate between the group with small, rotund conidia, exemplified by *S. maydis* and *S. sorghi*, and that characterized by larger, elongated to ellipsoid organs, represented by *S. philippinensis* and *S. sacchari*. Among other points of interest in connexion with *S. noblei* may be mentioned the regular occurrence of both reproductive stages on the same host (to which the pathogen appears to be limited), the production of the conidiophores at night when the plants are wet with dew, and the apparent restriction of the parasite to its indigenous Australian host.

Bortels (H.). **Ergänzende Mitteilung über die Wirkung von Molybdän-Düngungen auf Luzerne im Feldversuch.** [Supplementary note on the effect of fertilizing with molybdenum on Lucerne in a field experiment.]—*Zbl. Bakt.*, Abt. 2, ciii 9–11, pp. 129–133, 1 fig., 1 graph, 1941.

Experiments are reported and their results tabulated (cf. *Arch. Mikrobiol.*, viii pp. 13–26, 1937) from which it appears that a deficiency of available molybdenum and possibly also of boron [*R.A.M.*, xxi, p. 143] in the soil of a field at the Biological Institute, Berlin-Dahlem, was responsible for poor yields, susceptibility to infection by *Phoma medicaginis* [= *Ascochyta imperfecta*; *Pleospora rehmiana*: ibid., xvi, pp. 184, 258] and a species of *Verticillium*, and to frost injury in Mahndorf Blue Victoria lucerne. In 1939 the yields (at the second cutting) of plots receiving boron (0·1 gm. per sq. m.) but no molybdenum, molybdenum (0·5 gm. per sq. m.) but no boron and both elements were, respectively, 159, 146·8, and 162·5 kg. per plot of 8 by 8 m. compared with 150·7 for the untreated control, thereby confirming the observations of Dmitriev on clover in the U.S.S.R. (*Chemisat. socialist. Agric.*, x, pp. 80–81, 1938) to the effect that molybdenum and boron should be applied jointly in order to secure the best harvests. It should be noted that the test plots had already been treated with molybdenum in 1934, 1935, 1937, and 1938.

ORVAL (R.). **Paspalum dilatatum as a fodder crop.**—*Fmg S. Afr.*, xvii, 192, pp. 175–178, 1942.

In recommending *Paspalum dilatatum* as a fodder crop in South Africa, the author tates that its use involves no danger at all of poisoning to animals from *Claviceps aspali* [*R.A.M.*, xxi, p. 22], as the fungus is present only after the seed has formed, y which time the hay should have been cut.

EFEBVRE (C. L.) & JOHNSON (H. W.). **Collections of fungi, bacteria, and nematodes of grasses.**—*Plant Dis. Reptr*, xxv, 23, pp. 556–579, 1941. [Mimeographed.]

In the foreword to this 22-page list of fungi, bacteria, and nematodes of grasses the United States, compiled from collections made or received by the authors, is stated that specimens from different parts of the country differed widely in the ype of disease they showed. Most of the grasses from the humid eastern and southern tates showed one or more leaf spots. In the south-east, smuts and stem rust *Puccinia graminis*) were very scarce as compared with the central and far western tates. Ergots, however, were widespread and somewhat common, the two most equently found being *Claviceps paspali* on *Paspalum dilatatum* and other *Paspalum* pecies [see preceding abstract], and *C. purpurea* on many genera of grasses. During ach of the last four years, *C. paspali* was abundantly present from Virginia to Florida nd westwards to Texas. Root rots do not appear to cause as much injury in the outh-east as in the more western sections.

LLISON (J. L.) & CHAMBERLAIN (D. W.). **Grass diseases in Wisconsin in 1941.**—*Plant Dis. Reptr*, xxvi, 1, pp. 19–22, 1942. [Mimeographed.]

Brief observations on the grass diseases observed in Wisconsin (chiefly in the urseries at Madison) during 1941 are accompanied by a table showing the relative verity of the several pathogens on eight pasture grasses, and by a host index for the iseases affecting 14 hosts.

LASER (R. E.), VOLK (G. M.), & STOKES (W. E.). **Deficiency symptoms and chemical composition of Lespedeza as related to fertilization.**—*J. Amer. Soc. Agron.*, xxxiv, 3, pp. 222–228, 3 figs., 1 graph, 1942.

In a fertilizer test in 1939–40 on a Leon fine sand in the flat pine lands of peninsular lorida *Lespedeza* seedlings deprived of phosphorus were stunted, with short branch- g stems and leaves clumped closely to the main stem in an erect position. The olour of the dwarfed foliage ranged from a very dull, dark green to purple or purplish- reen. Potash shortage was manifested by stunting and foliar mottling, followed by urning or browning from the tips downwards. Soil analyses revealed an insufficiency f readily soluble phosphorus, calcium, and potassium, all of which should be added, doses of 450, 1,500, and 75 lb. per acre, respectively, to produce a satisfactory rowth of *Lespedeza* on the sites under observation. The increase of phosphorus in he plants resulting from the application of this element to the soil was accompanied y a highly significant rise in the nitrogen content.

UNG-HSIANG (L.). **A physiological study of the susceptibility of the blushed and green sides of Apples to certain fungous rots.**—*Phytopathology*, xxxii, 3, pp. 239–245, 1 diag., 1942.

In inoculation experiments at the New York (Cornell) Agricultural Experiment tation in 1940 the blushed side of apple fruits of several varieties was more slowly otted than the green side by *Penicillium expansum* and *Sclerotinia fructicola*, whereas *hysalospora malorum* [*P. obtusa*] and *Lambertella corni-maris* [*R.A.M.*, xv, p. 531] ted at a uniform rate on both sides. The slower rate of decay on the blushed side *Penicillium expansum* and *S. fructicola* was found to be correlated with higher gar and nitrogen and lower water contents and a firmer consistency of the tissues.

In connexion with the last-named property, it is suggested that the blushed side may contain a larger amount than the green of insoluble pectic substance, which would confer superior resistance to organisms penetrating the cell walls of their host by means of enzymatic action, e.g., *P. expansum* and *S. fructicola*.

Gallástegui (I.). **Tratamiento de invierno de Manzanos de sidra.** [The winter treatment of cider Apples.]—*Agricultura, Madr.*, xi, 117, pp. 17–19, 1 fig., 1942.

The principal fungous diseases against which cider apples require protection during the winter in Spain are those caused by grey rot (attributed to *Monilia* [*Sclerotinia*] *fructigena*), attacking the leaves, buds, and blossoms, and fruits, *Nectria galligena*, and *Armillariella* [*Armillaria*] *mellea*. Measures for control are briefly indicated.

Singh (L.) & Hamid (A.). **The cold storage of Pears (Bartlett) in the Punjab.**—*Indian J. agric. Sci.*, xi, 5, pp. 769–777, 1 pl., 1 graph, 1941.

Bartlett pears in cold storage at Lyallpur, Punjab, are subject to scald [*R.A.M.*, xix, p. 713] between 36° and 40° F., waterlogging at 32°, core breakdown [ibid., xvii, p. 468] at 36° and 40°, and low temperature injury below 32°. Infection by fungal pathogens, mostly the blue and green moulds [*Penicillium italicum* and *P. digitatum*], was of a mild order in the experiments described.

Smith (C. O.) & Smith (D. J.). **Host range and growth-temperature relations of Coryneum beijerinckii.**—*Phytopathology*, xxxii, 3, pp. 221–225, 2 figs., 1 graph, 1942.

During the season of 1940–1 the precipitation in southern California was approximately twice as heavy as in normal years, with a maximum in March and April, thereby providing ideal conditions for the development of *Coryneum beijerinckii* [*Clasterosporium carpophilum*] on stone fruits, the disease being observed in plantings at the Citrus Experiment Station on the foliage of *Prunus fenzliana*, *P. majestica*, and *P. umbellata*, and in commercial orchards on that of almond, apricot, Japanese plum [*P. japonica*] (very severe), and peach. Inoculation experiments with spore suspensions of pure cultures of the pathogen from peach, apricot, and almond gave positive results after an incubation period of a week or two on 35 *P.* spp., besides the above-mentioned, including cherry, *P. alleghaniensis*, *P. angustifolia*, *P. besseyi*, *P. bokhariensis*, *P. caroliniana*, *P. cerasifera* [*P. divaricata*], *P. davidiana*, *P. demissa*, *P. fremontii*, *P. hortulana*, *P. ilicifolia*, *P. kansuensis*, *P. lyonii*, *P. mahaleb*, *P. maritima*, *P. mexicana*, *P. mume*, *P. munsoniana*, *P. orthosepala*, *P. pissardi*, *P. pseudocerasus*, *P. reverchonii*, *P. salicina*, *P. serotina*, *P. spinosa*, *P. texana*, *P. watsonii*, and *P. yedoensis*. In pure culture on glucose-potato agar, the optimum temperature for the growth of *C. carpophilum* was 19° C., with a minimum below 8° and a maximum between 27° and 30·5°.

Drummond-Gonçalves (O.). **A crespeirà do Pessegueiro.** [Peach leaf curl.]—*Biológico*, viii, 1, pp. 21–22, 1 fig., 1942.

Peach leaf curl (*Taphrina deformans*), though not at present of economic importance in São Paulo, has of recent years become widespread in the State, due in part, no doubt, to the cold, damp weather in the early stages of vegetation, but at least in equal measure to the introduction of superior commercial varieties lacking the natural resistance of the common native fruit. A dormant application of 1 in 8 lime-sulphur or 1 per cent. Bordeaux mixture is recommended as the most effective control measure.

Bodine (E. W.). **Further notes on the incubation period of the Peach mosaic virus.**—*Science*, N.S., xcv, 2462, pp. 256–257, 1942.

In order to obtain further information on the incubation period of the peach mosaic

virus [*R.A.M.*, xxi, p. 295], seeds were planted in November, 1940, in Mesa County, Colorado, and by the following 15th May the resultant seedlings, numbering about 400, had attained a height of 4 to 6 in. Twenty ft. to the west of the trial plot was a row of 30 three-year-old Elberta trees affected by the severe strain of the virus, which on 25th August was observed to have passed to 15 of the seedlings. Thus, under these conditions of natural spread during the spring the incubation period was barely 100 days. This manifestation of the disease has never been recorded in one-year-old Elbertas in commercial orchards, and only very rarely in two- and three-year-old trees of the same variety [ibid., xvi, p. 544]. A comparable incubation period has been demonstrated in the case of spring bud and graft inoculations, whereas those made at or after midsummer induced no apparent symptoms until the following season. It is evident from these studies that the development of foliar symptoms calls for the immediate removal of all diseased trees.

Blodgett (E. C.). **A systemic arsenic toxicity of Peach and Apricot on old Apple land.**—*Plant Dis. Reptr*, xxv, 22, pp. 549–551, 1941. [Mimeographed.]

Since 1936 young peach and apricot trees in old apple orchards in Idaho have been observed to suffer from leaf spot, shot hole (in extreme cases 'lace leaf'), and defoliation, due to the presence in the soil of arsenical spray residues. The interveinal spots or blotches appear at midsummer and subsequently the tissues, usually commencing at the margin, undergo necrosis and fall out, either while still green or after turning yellow in August or early September. The older leaves are first affected, sometimes leaving only tufts of young foliage at the tops of the branches. In severe cases defoliation is sufficiently premature to prevent the proper maturation of the crop, and the small, bitter fruits are worthless. Only rather young trees are seriously affected. Ample evidence is available to the effect that peaches in particular are highly sensitive to arsenical injury, which has caused their complete defoliation in several orchards in the State where they are interplanted with apples receiving insecticidal treatments. Further work is in progress on the disorder under discussion, which is apt to be confused with various other troubles induced by quite different factors, notably shot hole (*Coryneum* [*Clasterosporium*] *carpophilum*) and X disease.

Bodine (E. W.) & Kreutzer (W. A.). **Ring spot of Apricot.**—*Phytopathology*, xxxii, 2, pp. 179–181, 1 fig., 1942.

A virulent disease of apricot, first observed near Palisade, Colorado, in 1935, since when it has steadily assumed increasing importance on the Montgamet and Moorpark varieties, is characterized by an irregular foliar spotting, with marked vein-clearing, followed by necrosis and crumbling of the tissues, imparting a frayed and ragged appearance to the leaves, and the development on the fruits, from about a fortnight before maturity (mid-June) onwards, of crateriform protuberances, with water-soaked, later buffy-citrine (Ridgway) to finally red-purple or red-brown margins. The bumpy appearance of the affected fruits may be partially obscured by the ripening process, but reddish-brown blotches or ring spots remain, frequently accompanied by cracking of the discoloured areas and disorganization of the underlying tissues to a depth of $\frac{1}{16}$ to $\frac{1}{8}$ or down to $\frac{1}{4}$ in. Trees showing one infected limb or twig in a growing season invariably become completely diseased within a year or two, and in no case during a five-year observation period has recovery been made. The eradication of diseased trees in 1937 and 1938 entirely arrested the spread of infection. Negative results were obtained in grafting experiments designed to ascertain the possible implication of the peach mosaic virus in the apricot disease, but the typical symptoms of the latter developed after two years in nursery apricot trees into which buds from affected individuals were inserted. The ring spot is thus evidently of virus origin, in which symptom expression is delayed two years. The infective principle

appears to be distinct from that involved in the apricot mosaic described by Atanasoff from Bulgaria [*R.A.M.*, xiv, p. 368].

Darrow (G. M.) & Waldo (G. F.). **Strawberry culture : western United States.**—*Fmrs' Bull. U.S. Dep. Agric.* 1027, 26 pp., 17 figs., 1 map, 1941.

This bulletin (revised from the original publication of 1919) contains brief notes (pp. 22–24) on the diseases affecting the strawberry crop in the western United States [cf. *R.A.M.*, xix, p. 402; xx, p. 348]. Red stele [*Phytophthora fragariae*: ibid., xxi, p. 86] is most prevalent on the heavier soils of western Oregon and Washington; the Marshall variety is highly resistant. In central California *Verticillium* [*albo-atrum*: ibid., xi, p. 727] is responsible for losses involving up to 75 per cent. of the crop, especially in stands following other hosts of the same pathogen, e.g., tomato, potato, and raspberry. In the Santa Clara-Watsonville district of the same State yellows [xanthosis] has practically exterminated the Marshall variety, which has been largely replaced by Nick Ohmer. Crinkle occurs in Oregon, Washington, and California. The use of clean stock and the roguing-out of infected plants are the only known methods of combating the virus diseases.

Kunkel (L. O.). **False blossom in Periwinkles and its cure by heat.**—*Science*, N.S., xcv, 2462, p. 252, 1942.

Through the agency of *Cuscuta campestris*, previously shown to be a vector of certain viruses [*R.A.M.*, xx, p. 590], the infective principle of false blossom of cranberry [ibid., xv, p. 238] was transmitted to the periwinkle (*Vinca rosea*), potato, tomato, tobacco, and *Nicotiana glutinosa*, the symptoms appearing in the first-named within a month from exposure to the parasite under favourable conditions. Transmission was further readily effected in all the new hosts by grafting.

Diseased periwinkles recovered completely from false blossom after a fortnight's exposure to a temperature of 40° C., which did not seriously impair the vigour of the plants, while a week sufficed to cure the tops only. Experiments are in progress to determine the suitability of this treatment for cranberries. In its response to heat in periwinkles the false blossom virus behaves similarly to that of aster yellows [ibid., xxi, p. 257].

Meredith (C. H.). **The effect of chemicals on Fusarium oxysporum cubense growing in the soil.**—*Phytopathology*, xxxii, 2, pp. 182–184, 1942.

Of a number of chemicals tested at the Glenleigh Laboratory, Friends' College, Highgate, Jamaica, for their toxicity to soil cultures of the agent of banana wilt, *Fusarium oxysporum* [var.] *cubense* [*R.A.M.*, xx, p. 543], the following may be mentioned: ethyl mercury iodide, the highest non-toxic and lowest toxic values of which were 0·0005 and 0·0025 per cent., respectively, formaldehyde (0·03 and 0·04 per cent.), mercuric chloride (0·04 and 0·05 per cent.), carbolic acid (0·37 and 0·75 per cent.), and sodium nitrite (0·1 and 0·5 per cent.), the comparable figures for Bordeaux mixture being 20 and 50 per cent., and for hydrated lime 5 and 6 per cent.

Fungicides and pest destroyers.—*J. Dep. Agric. Vict.*, xl, 2, p. 59, 1942.

The Standards Association of Australia has issued for public critical review a draft specification to be No. K.83 for Fungicides and Pest Destroyers, including suitable methods of sampling and analysis. The draft has been drawn up by the Australian Chemical Institute, and is now issued in the hope that all chemical manufacturing interests concerned and technical interests associated with farming will study it carefully and submit their views for consideration. The draft consists of three parts, viz. (i) schedule of requirements (including, among others, arsenicals, copper compounds, lime-sulphur solution, spraying oils and emulsions, and dusting sulphur), (ii) methods of sampling, and (iii) recommended methods of analysis.

Heuberger (J. W.). **Tenacity of protective fungicides.**—*Chron. bot.*, vii, 1, pp. 9–10, 1942.

Most of the author's experimental work on laboratory methods for the assessment of the degree of tenacity of protective fungicides, here briefly recapitulated, has been noticed from another source [*R.A.M.*, xx, p. 70], but some further points of interest may be mentioned. The inherent tenacity of a given preparation is usually believed to be increased by a reduction in the size of the individual particles constituting it, but a study of two copper sprays of identical chemical composition, the particles of one measuring 0·5 μ and those of the other 2 μ, showed the smaller to be no more adherent than the latter. Red cuprous oxide, which is of a soft consistency, has been shown to possess a higher tenacity value than copper zeolite, with its hard particles. Fixed copper sprays of low solubility tend to be more tenacious than those of high solubility. Two materials are now on the market which exert a spreading action without decreasing tenacity, namely, SS-3, a rosin spreader-sticker, and SEC oil, a self-emulsifying cottonseed product. From the limited data available the latter appears to be the better of the two. A considerable amount of field work with both these spreaders has been done by J. M. Hamilton at the New York State Agricultural Experiment Station.

Vlugschrift der Centrale Proefstations Vereeniging No. 5. Voorschrift voor de bereiding van Bordeauxsche pap. [Pamphlet No. 5 of the Central Experiment Stations' Association. Prescription for the preparation of Bordeaux mixture.]—*Bergcultures*, xvi, 1, pp. 5–7, 1942.

Practical directions are given for the preparation of 1-1–100 Bordeaux mixture, suitable spreaders for use with which in the Dutch East Indies include liquid sandovit (Van Gorkom), igepon-T [*R.A.M.*, xix, p. 200], lethalate, agral (all at 0·2 per cent.), tabak spreader B.P.M. (0·15 per cent.), T.F.O. oil N.K.P.M. (0·4 per cent.), and the fruits of *Sapindus rarak* (one to two per l. mixture), while the following are effective adhesives: glue (lemka) at the rate of 3 to 5 gm. per l., resin-soda solution (20 c.c. per l.), calcium caseinate (40 c.c. per l.), and molasses (5 to 10 gm. per l.).

Boyd (O. C.). **The weather and disease situation in Massachusetts in 1941.**—*Plant Dis. Reptr*, xxvi, 1, pp. 2–10, 1942. [Mimeographed.]

Unusual weather conditions prevailed during the growing season in Massachusetts in 1941, when an early, warm, dry opening period was followed by an abnormally hot June, with a high, continuous wind from 8th to 11th, and an unevenly distributed rainfall, the total precipitation for the State being 9·34 in. above the normal, while in Essex County it fell to barely 60 per cent. of the mean: July was also slightly above the normal both as regards temperature and rainfall, whereas from August to October precipitation was deficient. Taking the season as a whole, it ranks as warm and dry, the increase in the mean temperature for the period from March to October being 7·1° F. and the mean deficit in rainfall for the same period 7·7 in. These exceptional factors were conducive to excessively severe outbreaks of certain plant diseases, e.g., angular leaf spot of pickling cucumbers (*Phytomonas* [*Pseudomonas*] *lacrymans*)—the heaviest and most widespread, especially in the Connecticut Valley, for twelve years: mosaic of the same host, directly associated, like bacterial wilt [*Erwinia tracheiphila*], with large populations of the striped cucumber beetle [*Diabrotica melanocephala*]; and bacterial ring rot [*Bacterium sepedonicum*] of potatoes, introduced from Maine [see above, p. 322] both on certified and uncertified seed. Among the diseases new to, or of rare occurrence in, Massachusetts may be mentioned red stele [core] of strawberries (*Phytophthora fragariae*) (mainly Howard 17), reported for the first time and confirmed by J. B. Demaree; *Bact. vesicatorium* [*Xanthomonas vesicatoria*] on Victor tomatoes in Worcester County, the first record for twelve years; cabbage yellows

(*Fusarium conglutinans*), occurring in a virulent form, also for the first time for twelve years, and causing 5 to 75 per cent. infection, with up to 25 to 30 per cent. loss, in Essex County, especially on the Penn State and Golden Acre varieties, a resistant strain of Copenhagen showing only mild symptoms. The high April temperature, 5·3° above normal, probably resulted in a corresponding access of warmth in the soil, which persisted through June and July, thereby affording unusually favourable conditions for the yellows fungus, which is reported to assume an active habit only above 63° and to flourish between 80° and 90° [*R.A.M.*, vi, pp. 265, 366].

GLABE (E. F.). **Preventing spoilage by mold and bacteria.**—*Food Industr.*, xiv, 3, pp. 46–48, 4 figs., 1942.

Recent investigations have shown that sodium diacetate, vinegar, monocalcium acid phosphate, and the calcium and sodium salts of propionic acid [*R.A.M.*, xxi, p. 256] act as inhibitors of mould (*Aspergillus niger*, *Rhizopus nigricans*, *Penicillium stoloniferum*, and *Monilia sitophila*) growth in bread, the annual loss from which in the United States has been computed by Pirrie (*Bakers' Wkly*, 9th June, 1934) at 100,000,000 loaves. Of 269 baking companies interrogated, in connexion with hearings on definitions and standards of identity for white bread and other bakery products, 221 (82 per cent.) reported trouble at various times with epidemics of mould in their plants.

The diploid cell and the diploidisation process in plants and animals, with special reference to the higher fungi—criticism and rebuttal.—*Bot. Rev.*, viii, 3, pp. 191–193, 1942.

A letter is printed from Miss Mary Noble to the effect that Dr. Buller's recent paper on diploidization [*R.A.M.*, xx, p. 588] contains misstatements concerning her work on *Typhula trifolii*, together with a reply from Dr. Buller.

Agricultural research. N.-Pathology.—*Rep. imp. Coun. agric. Res., New Delhi, 1940–41*, p. 36, 1942.

Vein-clearing is the first symptom of yellow vein mosaic of *Hibiscus esculentus* in the Bombay district, sharply delineated patterns being formed in the young foliage, except in severe cases, characterized by general chlorosis. All growth made subsequent to infection is dwarfed, and flowering and fruiting are sparse. The virus is transmissible by grafting and through the agency of *Bemisia gossypiperda* but not by the sap, and no indication of seed transmission has been obtained. The appearance of the symptoms was delayed by nitrogen or phosphorus deficient culture solutions. Chilli leaf curl has been shown to be caused by the feeding of *Scirtothrips dorsalis* on the young foliage, and not by a virus [*R.A.M.*, xviii, pp. 432, 433]. *Phaseolus lunatus* and *Dolichos* were each found to be affected by a new virus, the yellow mosaic of the former being transmissible by *B. gossypiperda* and the ordinary mosaic of the latter by means of the sap. Rugose mosaic of tomato causes dwarfing of the plants, foliar stunting, and thickening and wrinkling of the leaflets, which develop a faint mottle and tend to curl upwards; advancing maturity is accompanied by marked stunting of the shoots and leaflets and by shortening and pallor of the petioles. The virus is communicable by means of the sap and *B. gossypiperda*. *Datura fastuosa* suffers from a sap-transmissible virus causing a typical green foliar mottling.

RAPER (J. R.). **Sexual hormones in Achyla. III. Hormone A and the initial male reaction.**—*Amer. J. Bot.*, xxix, 2, pp. 159–166, 6 graphs, 1942.

After referring to his earlier studies on the activity of hormones in initiating and co-ordinating sexual reproduction in *Achyla bisexualis* and *A. ambisexualis* (vide

Science, N.S., lxxxix, pp. 321–322, 1939; *Amer. J. Bot.*, xxvi, pp. 639–650, 1939; xxvii, pp. 162–173, 1940; and *Mycologia*, xxxii, pp. 710–727, 1940), the author gives a full account of experiments which demonstrated that the initiation of the entire sexual reproductive process is brought about through the production by the vegetative mycelium of the ♀ of hormone A, which induces the formation of antheridial hyphae on the male mycelium.

MAYER (A.). **Concerning the mosaic disease of Tobacco.** IVANOWSKI (D.). **Concerning the mosaic disease of the Tobacco plant.** BEIJERINCK (M. W.). **Concerning a contagium vivum fluidum as a cause of the spot-disease of Tobacco leaves.** BAUER (E.). **On the etiology of infectious variegation.—Translated from the German by J. Johnson.**—*Phytopath. Class.* 7, 62 pp., 7 pl., 1942. $0·75.

The publication of translations of these four papers, which are well-known to all plant virus workers but read by few, will be welcomed by students of virus diseases and the history of science. There is a portrait of each author accompanied by a short biographical account by Professor Johnson.

JOHNSON (J.). **Virus nomenclature and committees.**—*Chron. bot.*, vii, 2, pp. 65–66, 1942.

The many individual proposals for the nomenclature and reclassification of viruses are deprecated as adding unnecessary complications to an already confused and still fluid situation. The work of the International Committee on Virus Nomenclature, at present suspended owing to world hostilities, will ultimately, it is hoped, lead to the universal adoption of a consistent scheme of terminology, pending which attempts to transfer the viruses already known from one category to another, or to give a final form to the names of newly discovered ones, are regarded as undesirable.

FAWCETT (H. S.). **Virus nomenclature.**—*Chron. bot.*, vii, 1, pp. 7–8, 1942.

The writer's arguments in favour of a Latin binomial system of virus nomenclature have already been summarized [*R.A.M.*, xx, p. 174]. They are here recapitulated, with special insistence on the choice of some characteristic effect of the virus on its host or other significant relationship as the basis of a name, which should not be derived merely from the specific or generic name of the diseased plant, since the latter practice might give rise to confusion where more than one virus attacks a particular host. For instance, taking *X* to represent any genus that may be selected, appropriate names would be *X. astri*, *X. zonatus*, *X. rubiginosum*, *X. lethale*, *X. erodens*, and *X. orientalis*, whereas such designations as *X. solani*, *X. persicae*, *X. medicaginis*, *X. betae*, *X. citri*, and *X. caricae* would be unsuitable and likely to lead to confusion.

GOWEN (J. W.). **Mutation in Drosophila, bacteria, and viruses.**—*Cold Spr. Harb. Symp. quant. Biol.*, ix, pp. 189–193, 1 graph, 1941.

The studies of the writer and his collaborators on the frequency of spontaneous variants in bacteria (including *Phytomonas* [*Aplanobacter*] *stewarti*) from maize [*R.A.M.*, xix, p. 468], the ordinary and aucuba mosaic viruses of tobacco, and *Drosophila melanogaster* showed the incidence of such aberrations from the type to be ordinarily low but subject to increase on exposure to comparable doses of X-rays. The rates at which the mutants appear are of the same order of magnitude for all three forms, perhaps indicating a common basic structure for inheritance liable to departures from the normal course under the influence of appropriate stimuli.

Anti-bacterial substances from moulds.

Raistrick (H.) & Smith (G.). **Part I. Citrinin, a metabolic product of Penicillium citrinum Thom.**—*Chem. & Industr.*, lx, 47, pp. 828-830, 1941.

Oxford (A. E.), Raistrick (H.), & Smith (G.). **Part II. Penicillic acid, a metabolic product of Penicillium puberulum Bainier and Penicillium cyclopium Westling.**—ibid., lxi, 2, pp. 22–24, 1942.

Oxford (A. E.). **Part III. Some observations on the bacteriostatic powers of the mould products citrinin and penicillic acid.**—ibid., 4, pp. 48-51, 1942.

Oxford (A. E.) & Raistrick (H.). **Part IV. Spinulosin and fumigatin, metabolic products of Penicillium spinulosum Thom and Aspergillus fumigatus Fresenius.**—ibid., 11, pp. 128–129, 1942.

Oxford (A. E.). **Part V. The bacteriostatic powers of the methyl ethers of fumigatin and spinulosin and other hydroxy-, methoxy- and hydroxymethoxy-derivatives of toluquinone and benzoquinone.**—ibid., 17, pp. 189-192, 1942.

In the course of several years of intensive studies of the metabolic products of moulds [cf. *R.A.M.*, xv, p. 170] four were found to possess strong anti-bacterial properties [ibid., xx, p. 485; xxi, p. 216]. Citrinin, isolated in a pure state from *Penicillium citrinum*, and penicillic acid from *P. cyclopeum*, both inhibited the growth of *Staphylococcus aureus*. Tested on a large number of bacterial pathogens, citrinin proved particularly active against Gram-positive and penicillic acid against the coli-typhoid-*Salmonella* group of Gram-negative bacteria. Spinulosin, isolated from *P. spinulosum*, was found to be only a weak anti-bacterial agent, but fumigatin from *Aspergillus fumigatus* was very powerful, particularly against *Vibrio cholerae*, *Bacillus anthracis*, and certain strains of *Staphylococcus aureus*. Both substances were also obtained synthetically. In a test of 15 derivatives of toluquinone and 7 of benzoquinone on a number of Gram-positive bacteria, some were found to be considerably more bacteriostatic than fumigatin.

Thomas (R. C.). **Composition of fungus hyphae. III. The Pythiaceae.**—*Ohio J. Sci.*, xlii, 2, pp. 60–62, 1942.

An analysis, by both microchemical and macrochemical methods, of the mycelium of six species of *Pythium* obtained from the American Type Culture Collection (*P. debaryanum*, *P. vexans*, *P. ultimum*, *P. acanthicum*, *P. aphanidermatum*, and *P. spinosum*) and of three unidentified isolates of the same genus, all cultured on potato broth, showed that the hyphae of all these species had the same composition. The outer walls of young hyphae were found to contain pectic material, and when this was removed by immersion in suitable solvents, a layer of cellulose was disclosed beneath. Old mature hyphae were doubly refractive to polarized light and therefore devoid of pectic substances. The pectic material in young hyphae completely masked the cellulose and prevented reagents from reaching it. The cellulose was strongly impregnated with fatty acids and, therefore, incapable of fixing dyes. Fatty acids were easily removed by saponifying with alcoholic potash. Following dissolution of cellulose in ammoniacal cupric hydrate or a hydrolysis with 70 per cent. sulphuric acid, a solid residue was obtained which was identified as chitin.

Elmer (O. H.). **Prevention of Potato seed piece decay.**—*Amer. Potato J.*, xix, 2, pp. 19–23, 1942.

A tabulated account is given of a series of tests carried out at the Kansas Agricultural Experiment Station from 1935 to 1940 to determine the relative efficacy of various disinfectant treatments on the prevention of potato seed piece decay (largely due to a watery soft rot, apparently of bacterial origin), which was exceptionally

severe in the first year of the trials, with only 27·7 per cent. of the untreated material in a sound condition, but relatively mild during the succeeding period, when the corresponding average amounted to 79·5. The best control was obtained by a momentary dip of the uncut tubers in a mercuric chloride solution (3, 4, or 5 in 500) plus 1 per cent. hydrochloric acid, which gave averages of 99, 99, and 97·3 per cent. sound seed pieces, respectively. Yellow oxide of mercury (1 lb. in 15 gals.) was also effective, a momentary dip resulting in 94 per cent. healthy material in 1935 and an average of 96·9 per cent. in the five following seasons, the corresponding figures for five minutes' immersion in hot formaldehyde (1 in 120 at 125° F.) being 76·4 and 93·7 per cent., respectively. Among other preparations tested, red oxide of copper and calomel [mercurous chloride] failed to confer adequate protection, while pre-planting suberization of the cut seed pieces likewise proved ineffectual. The acidulated mercuric chloride incidentally gave excellent control of *Rhizoctonia* [*Corticium solani*: *R.A.M.*, xxi, p. 263 and above, p. 322].

Beaumont (A.) & Large (E. C.). **Potato spraying in the south-west. Lessons from 1941.**—*J. Minist. Agric.*, xlviii, 4, pp. 235–240, 1942.

During 1941 potato blight (*Phytophthora infestans*) did not appear over most of Devon until the middle of August. Little rain fell in July, but much in August and the first week of September, and the blight attack was late and rapid. Since the season was also late, the foliage became infected when the maincrop varieties were in the middle of ware tuber production, and the loss of ware in unsprayed crops ranged from 2 to 5 tons per acre. At most of the 34 centres in Devon and Cornwall where spraying demonstrations were given there was no disease, or very little, in the tubers; at a few centres, where the soil was heavy, slight infection of the tubers occurred, but it was always less in the sprayed than in the unsprayed plots.

At every centre where two applications of Bordeaux mixture were made, good foliage protection resulted, and loss of crop was almost completely prevented. At one centre, for example, sprayed Majestic potatoes yielded 12·7 tons of ware per acre, as against 7·4 tons for the unsprayed. In other localities increases of from 2 to 4 tons per acre in yield of ware were obtained. In general there was a gain of over 1 ton per acre for every week that most of the sprayed foliage remained green after the unsprayed plants were all but destroyed.

As infection occurred so late, one spray, properly timed, was found to be sufficient. Spraying had its maximum effect when carried out just before the disease broke out in the locality concerned, so that very little protective deposit was washed off before the attack began. Timing was much more important than the kind of spray used. In one area Great Scot potatoes sprayed on 4th August gave a total yield (ware, seed, and chats) of 7·9 tons per acre, against 4·9 for the unsprayed, while in another King Edward potatoes sprayed on 12th August gave a total yield of 14·8 tons per acre, as against 14 for the unsprayed, the application having been delayed until after the attack had begun. Here and at three other centres it was found that spraying was effective as long as there were only two or three spots on each plant; it failed if delayed only two days after this, i.e., until there were more than a dozen spots on each plant.

Spraying ought not to be deferred until the disease has already appeared locally, unless there is absolute certainty that the acreage can be covered in time. Where two applications were made, one early, the other just before the outbreak, the second was the more effective. A single spray, six weeks to a month before blight appeared, invariably had some effect, and at some centres appreciably increased yield.

Arran Consul potatoes were treated on 30th June and 31st July with Bordeaux mixture (4-5(hydrated lime)-40), five proprietary wet sprays, i.e., ready-made Burgundy mixture (containing 15 per cent. copper and used at the rate of 7 lb. per

40 gals.), a yellow cuprous oxide spray containing 50 per cent. copper, and used at 2 lb. per 40 gals., two copper oxychloride sprays containing 50 per cent. copper, and used at the same rate, and one copper oxychloride spray, sold in liquid form, containing 15 per cent. copper and used at 2 pints per 40 gals., and two dusts, i.e., copper-lime containing 16 per cent. copper, and a cuprous oxide dust containing 17·5 per cent. copper, both being applied at 25 lb. per acre (the sprays being used at 100 gals. per acre). The total yields were, respectively, 16, 15, 15·1, 15, 14·5, 14·5, 13·9, 13·2, and 13·2 tons per acre, as against 13·2 tons per acre for the untreated controls. These results agreed with general experience at all the centres, and were supported both by observations on foliage condition during the whole course of the attack, and by chemical analyses of the deposit on the leaves after a month of rain. Freshly made Bordeaux mixture gave the best results on all counts. All the proprietary sprays gave good control. The dusts were ineffective.

In preparing the Bordeaux mixture the 40 gals. water were put in a wooden barrel, a pailful removed and the hydrated lime creamed in it, the granulated copper sulphate crystals were dissolved in the water in the barrel, and finally the lime solution added. In this way the bulk of the water was used to dissolve the copper sulphate as rapidly as possible and the galvanized pail did not come into contact with the copper solution.

Owing to its non-persistence, dusting was found to afford only a temporary protection. In one locality two dust applications when the leaves were moist with rain increased the yield of ware from 7·4 to 9·8 tons per acre, as against 12·7 tons per acre for two applications of Bordeaux mixture. This was the only passably good result given by dusting. Some details are given on spraying machines and spray costs. In Cornwall a good deal of contract spraying was done at 17*s.* 6*d.* per acre.

In 1942 growers in south-western England are advised to spray immediately warning of blight is published in the newspapers and to repeat the application three weeks to a month later.

Texera (D. A.) & Müller (A. S.). **La podredumbre anular o marchitez bacteriana de las Papas.** [Ring rot or bacterial wilt of Potatoes.]—*Agricultor venez.*, v, 57–58, pp. 27–30, 2 figs., 1941.

During the last two years potato ring rot (*Phytomonas sepedonica*) [*Bacterium sepedonicum*] has been observed in various parts of Venezuela [see above, p. 324], including certain valleys of the Táchira and on the mountains along the coast from Miranda to Yaracuy; in November, 1939, nearly 100 per cent. of the plants were affected in some of the fields round San Cristobal, while in others the average percentage ranged from 10 to 60. The disease was experimentally shown to be transmissible through the tubers, by means of an infected cutting knife, and by contact. Tomato and eggplant seedlings grown in pots previously occupied by diseased potatoes contracted ring rot within a month, whereas chilli plants remained healthy under the same conditions. The pots were then left unplanted and without water for four months, during which period the pathogen apparently died out, since the next lot of potatoes did not develop the disease. *Bact. sepedonicum* appears from preliminary tests to thrive equally in acid (P_H 5·3 to 5·9) and alkaline (7·6 to 7·8) soils, and to be favoured by excessive irrigation.

Rodriguez (L.). **La 'alternariosis' de la Patata.** ['Alternariosis' of the Potato.]—*Bol. Inst. bot. Univ. centr., Quito*, i, 1, pp. 85–124, 6 figs., 1942.

This is a comprehensive study of the history, geographical distribution, economic importance, symptomatology, morphology, life-history, culture, taxonomy, epidemiology, and control of the causal organism of early blight of potatoes (*Alternaria solani*), with special reference to the environmental conditions prevailing in the provinces of Pichincha, Cotopaxi, and Tungurahua, Ecuador.

Acock (A. M.). **An examination of Mulder's rapid biological method for estimating the amount of available copper in soils.**—*J. Coun. sci. indus. Res. Aust.*, xiv, 4, pp. 288–300, 1 graph, 1941.

An investigation of Mulder's claims that mould fungi can be used to assess the availability of copper in soils [*R.A.M.*, xviii, p. 241] confirmed the observation that the spore colour of *Aspergillus niger* grown on copper-deficient media depends on the amount of available copper. It was ascertained that when soil suitably diluted with copper-free culture medium is used as the only source of copper, the resultant spore colour of cultures of *A. niger* can be used as an indicator of the amount of copper in the soil available to the fungus. From a study of 46 Australian soils it was empirically established that soil 'sound' in respect of copper can be distinguished from 'unsound' soils, since the availability of copper to *A. niger* apparently parallels that to higher plants. Of eight strains tested, *A. niger* Neuberg (ex Lister 2380) was found to be the most suitable for the purpose. The paper concludes with a full description of a modified form of Mulder's technique which is recommended, emphasis being laid on the need for partially sterilizing the soil before adding the cultures.

Leece (C. W.). **Downy-mildew of Sugar Cane and other grasses.**—*Tech. Commun. Bur. Sug. Exp. Stas Qd, 1941*, 5, pp. 111–135 (1–25), 13 figs., 1941.

After reviewing the history and distribution of sugar-cane downy mildew (*Sclerospora sacchari*) [*R.A.M.*, xx, p. 277], fully describing the symptoms, and discussing the question of transmission, the author gives a detailed account of work conducted (chiefly in Brisbane) from 1938 to 1941 in which different grasses were tested (by being planted in proximity to affected cane) for their ability to act as alternate hosts. The results [cf. ibid., xx, p. 230] showed that maize and teosinte (*Euchlaena mexicana*) were highly susceptible, while sorghum was moderately resistant; the development of leaf markings on *Sorghum halepense* and *S. sudanense* indicated that these can serve as alternate hosts, but no symptoms of infection appeared on *Panicum maximum* or its var. *coloratum*, *Brachiaria purpurascens*, *Echinochloa frumentacea*, *Pennisetum purpureum*, *P. typhoides*, *Chloris gayana*, *S. vulgare* (Egyptian wheat), and *Erianthus arundinaceum*.

The diseased maize plants were frequently very malformed and gave greatly reduced yields; mycelium was found in the seed, but infected seed produced healthy plants. Abundant conidia were present under favourable conditions, but no oospores were observed. Under controlled conditions the disease was readily transmitted from maize to sugar-cane [ibid., xix, p. 166].

The available evidence indicates that while maize is of little importance in the perpetuation of sugar-cane downy mildew, it is potentially a serious factor in rapid dissemination where a source of infection already exists. The prohibition of maize planting in the vicinity of diseased sugar-cane in the Bundaberg district has been followed by a marked reduction in incidence.

Chona (B. L.) & Padwick (G. W.). **More light on the red-rot epidemic.**—*Indian Fmg*, iii, 2, pp. 70–73, 1 pl., 1942.

During 1940–1 the epidemic of sugar-cane red rot (*Colletotrichum falcatum*) previously reported from northern India [*R.A.M.*, xx, p. 228] continued to rage in northern Bihar and the eastern United Provinces. It spread to new localities in these areas, and was also observed in the central and western United Provinces, e.g., at Fyzabad, Shahjahanpur, Bareilly, Moradabad, Lhaksar, and Saharanpur. Co. 213 was the variety mainly affected in the different places, but in northern Bihar Co. 210, 299, and 331 and in the United Provinces Co. 210, 290, 299, 331, 370, 393, 421, 442, 445, 537, and Co. S. 5 were also attacked, Co. 299 and Co. 331 to a considerable extent. Occasional infections of Co. 312 in Fyzabad, Lhaksar, and Moradabad, and of Co. 356 in Sidhwalia were also noted. The disease was present not only in low-lying,

badly drained fields, but over a vast area comprising a wide range of soil and climatic conditions.

In investigations into the part played by cane debris in setting up infection from the soil, Co. 213 setts were planted in large pots and affected cane material placed round the setts, no diseased debris being applied to the controls. Some three months later 20 shoots out of 87 in the infected pots had dried up, as against only one in the controls, *C. falcatum* being isolated from the setts and dying shoots. In a field test Co. 213, 419, 444, and 445 setts were planted, and affected material of Co. 537 applied as debris in the furrows. About ten months later some of the shoots had dried up and died; typical blotches were found on the stalks, and acervuli of *C. falcatum* were noted on the leaf sheath, leaf midrib, and rind. Pink spore masses were abundantly present on the uppermost setts enclosed in the leaf sheath. Only Co. 213 was affected when the observations were made, and no disease was present in the control plots.

A third test was conducted, on the March-planted crop of the 1940-1 season, using Co. 213, 299, 312, 313, 331, and 419 and applying diseased material of Co. 213 from Lhaksar. By the end of July, 11 shoots in Co. 213, 2 in Co. 299, and 7 in Co. 313 showed very severe infection. The central spindle was killed, and numerous patches of acervuli were found on the basal part of the spindle and the midrib of the first partly unfolded outermost leaf of the spindle; the lesions extended to the leaf lamina. In this spindle type of lesion infection appeared to be rising from the shoot below. Reisolations from the midrib lesions, the affected shoots, and the mother sett yielded typical *C. falcatum* of the light type.

When pure cultures of the fungus were applied to furrows planted with sugar-cane, infection again resulted, whereas the control plot remained healthy.

From these results it is clear that control depends not only on clean 'seed' but on clean soil as well.

Of about 700 diseased clumps examined in various fields in 40 different localities in the affected areas of northern Bihar and the eastern United Provinces, 207 showed nodal infection in the complete absence of basal infection. In most cases secondary infection was present though no borer attack was observed. Nodal infection makes the selection of 'seed' more difficult as incipient infections of this type may escape detection.

In about 1,000 isolations made from different areas, a light-coloured type of *C. falcatum* has predominated, with abundant sporulation [ibid., xxi, p. 162]. All isolations made before the present epidemic were of a dark type with sparse sporulation. There are indications that the new strain is more virulent than the old, particularly on Co. 213. Further work is in progress.

Edgerton (C. W.), Forbes (I. L.), Mills (P. J.), Dufrénoy (J.), & Luke (W. J.). **The hot water treatment of Sugarcane. A report of progress.**—*Bull. La agric. exp. Sta.* 336, 27 pp., 1942.

This is a collection of papers on the experimental control of sugar-cane diseases by hot-water treatment in Louisiana.

I. L. Forbes (pp. 5–7) presents the results of experiments carried out in 1939 and 1940, in which treatment for 20 or 30 minutes in hot water at 52° C. completely controlled chlorotic streak [*R.A.M.*, xx, p. 178]. Thus, while no diseased plants appeared in plots planted with treated diseased setts of varieties C. P. 807, C. P. 28–19, and C. P. 29–320 in 1939 and of the two last-named in 1940, the figures for the untreated diseased plots of the same varieties at the end of 1940 and 1941, respectively, were 31·1 and 43·3 (two experiments), 31·1, 21·8 and 97·7 (two experiments), 26·59 and 31·25 per cent., respectively. The treatment also gave an appreciable increase in germination and in the rate of growth of both diseased and healthy canes.

C. W. Edgerton, I. L. Forbes, and P. J. Mills (pp. 7–8) state that in small scale experiments conducted during 1939 to 1941 yields of commercial sugar-cane varieties

treated against chlorotic streak [loc. cit.] with hot water at 50° and 52° for 20 or 30 minutes were either superior or equal to those of the untreated control (average of 23·48 tons of cane per acre following treatment at 52° as compared with 19·33 tons for the control in the first year; and of 27·15 and 27·26 tons following treatment at 50° and 52°, respectively, as compared with 27·26 tons for the control in the next year). Treatment at 45°, 54° and 56° resulted in reduced yields.

I. L. Forbes's investigations (pp. 9–10) into the effect of the hot-water treatment on the resistance of the cane to subsequent artificial infection by red rot [*Colletotrichum falcatum*: ibid., xxi, p. 303] showed that in every one of the ten commercial sugar-cane varieties used in the tests (representing all degrees of resistance and susceptibility to red rot within Louisiana canes) the red rot damage was much more extensive in the untreated canes. When canes were inoculated with the red rot fungus prior to hot-water treatment for 20 minutes at 52°, no trace of infection was found in any plants treated within two days of inoculation, whereas those treated three, four, and five days after inoculation showed definite lesions, though less well developed than in the untreated inoculated lots. These results are taken to indicate that the mycelium of the red rot fungus in well established lesions is not entirely destroyed by hot water. When spore suspensions of the red rot fungus were treated at 52° for 5, 10, and 20 minutes prior to inoculation into canes, no red rot developed in any of the plants, indicating that the spores were destroyed during treatment.

J. Dufrénoy (pp. 10–11) discusses the biochemical aspects of the hot-water treatment of sugar-cane. When tissues of cane treated at 52° for 20 minutes were immersed in certain indicator solutions such as ortho-diphenol, para-diphenol, catechol, and adrenaline, which normally become coloured upon the addition of oxygen, these solutions became coloured at a more rapid rate or more deeply, the results indicating that there was more available oxygen in the cells of treated canes. When the same test was applied after treatment at 60°, the solutions did not become coloured. When such tissues were inoculated with the red rot fungus, growth of mycelium occurred, but no red pigment developed. It is concluded that the ability of the cane tissue to accept, hold, and give up oxygen was destroyed at 60°.

W. J. Luke (pp. 12–27) gives the results of one year's co-operative field experiments among nine plantations on the control of chlorotic streak by hot-water treatment. It was found generally that treatment stimulated the germination of the buds. With regard to yields, a slight decrease occurred in some treated plots and an increase in others. However, the variety C.P. 29–320, which was included in all nine test fields, showed a decrease of yield following hot-water treatment only in the August planting (average decrease of 1·76 tons per acre, due largely to the failure of one plot), whereas in the September, October, and November plantings, the yield was increased by about 3·9, 3·7, and 3·0 tons per acre, respectively, in the treated plots.

MARTIN (J. P.). **Pathology.**—*Rep. Hawaii Sug. Exp. Sta., 1941* (ex *Proc. Hawaii Sug. Pl. Ass., 1941*), pp. 28–42, 1942.

In this report [cf. *R.A.M.*, xx, p. 424] it is stated that during 1941 the incidence of sugar-cane eye spot (*Helminthosporium sacchari*) in Hawaii was the lowest for many years. The rapid spread of the highly resistant varieties 31–1389, 32–1063, 32–3575, and 32–8560 has greatly increased control.

Brown stripe (*Cochliobolus stenospilus*), confined mainly to localized areas on Oahu and Kauai, showed no increase in severity. On Kauai, the variety 35–1458 was found to be highly susceptible. Control consists in planting resistant varieties and building up soil fertility.

Leaf scald [*Bacterium albilineans*] chiefly attacked Yellow Caledonia canes, 28–4291, and 29–3859. No infection has so far been seen by the author and C. W. Carpenter on 32–1063 or 32–8560, though one report was received that 32–8560 was affected on Hawaii. In varietal resistant tests both varieties remained unaffected, even when the

cuttings were experimentally inoculated. Plantings of both varieties in areas previously planted to Yellow Caledonia, where infection was very serious during dry spells, showed no sign of the disease.

Mosaic incidence is rapidly declining, as a result of the use of resistant varieties, the selection of only healthy planting material, weed control, and roguing. No mosaic has yet been noted on 32–1063 or 32–8560.

Field and laboratory studies on these and other sugar-cane diseases by C. W. Carpenter are reviewed. Many varieties were observed to tolerate brown stripe. In one field experiment highly significant losses in cane and sugar resulted when cuttings were planted affected by chlorotic streak, a major disease in some areas. When, however, diseased cuttings were subjected to hot-water treatment, marked gain resulted over the affected, untreated cuttings. All diseased or questionable planting material should be treated with hot water. The test also demonstrated that 31–2806 is more tolerant of chlorotic streak than P.O.J. 2878.

Several flats of thickly germinated seedlings showed localized patches of eye spot, and a species of *Helminthosporium* (possibly *H. sacchari*) was ascertained to be attacking the plants just above ground-level. Disease development was favoured by high moisture and rapid growth. The affected flats were isolated, and several applications of calo-clor (mercurous and mercuric chloride) were applied to the diseased plants, irrigation also being reduced. Infection was considerably checked, and no apparent injury resulted from the treatment.

Varietal resistance tests indicated that most sugar-cane varieties locally grown are commercially resistant to leaf scald. The disease was present in nearly every planting of Waipahu 153, which was used as a control, and in most of the plots the cane died out. The variety 36–4510 was susceptible. Severity was greatly increased in susceptible varieties by unfavourable environmental conditions.

When P.O.J. 2878 was grown under a partial shade of lath and sprinkled frequently with water some 'pokkah-boeng' (*Gibberella fujikuroi*) developed. The fungus is ubiquitous but only becomes serious in hot, moist weather. The variety 32–1063 is rather susceptible, but apparently sustains no appreciable injury.

Pythium root rot of sugar-cane, formerly attributed to *P. graminicola* [ibid., xx, p. 425], is now stated to be due to *P. arrhenomanes*.

In an investigation into sugar-cane physiological disorders, the varieties H 109, 31–2806, 32–1063, and 32–8560 were grown in a complete nutrient solution and in solutions lacking nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, iron, manganese, and boron, respectively. When any one element was omitted, growth and cane and sugar yields of each variety were depressed. Symptoms typical of the deficiency of each element developed on all varieties, but some were much more tolerant of certain deficiencies than others. Under field conditions the juice quality of a variety may be improved in specific areas by applying certain elements to the soil.

Other diseases investigated included red bread mould (*Neurospora sitophila*) [ibid., xix, p. 32] on sugar-cane in seedling flats, leaf spot of figs (*Cercospora bolleana*) [ibid., xvi, p. 823], crape myrtle [*Lagerstroemia* sp.] leaf mildew (*Uncinula australiana*), and snapdragon [*Antirrhinum majus*] rust (*Puccinia antirrhini*).

ARWIDSSON (T.). **Die in Schweden beobachteten Arten von Pucciniastrum Otth und verwandten Uredineengattungen.** [The species of *Pucciniastrum* Otth and related genera observed in Sweden.]—*Svensk bot. Tidskr.*, xxxvi, 2–3, pp. 100–107, 1942.

This is a critically annotated list of 22 Pucciniastreae [*R.A.M.*, xvi, p. 63] collected in Sweden, comprising species of *Hyalopsora*, *Melampsorella*, *Melampsoridium*, *Pucciniastrum*, *Thekopsora*, *Uredinopsis*, *Calyptospora*, and *Milesia* [*Milesina*]. *C. goeppertiana* [ibid., xviii, p. 491] was detected by T. Lagerberg in 1937 in the teleutospore stage on *Vaccinium vitis-idaea* on Öland, this being the first authenticated record for the country.

KARLING (J. S.). **Parasitism among the Chytrids.**—*Amer. J. Bot.*, xxix, 1, pp. 24–35, 47 figs., 1942.

A critically annotated list is given of nine Chytridiales parasitic on other members of the same family, five of which, belonging to the genus *Rozella*, cause marked local hypertrophy or septation, or both, of the host cell. One of the species under discussion is new (*R. rhizophlyctii*), and a new genus, *Rozellopsis* [without a Latin diagnosis], is erected to accommodate four species (one new) with biflagellate zoospores which cannot be included in *Rozella*. *Pleolpidium* is reduced to a synonym of *Rozella*.

CHARDON (C. E.). **Exploraciónes micológicas de la América tropical: un ejemplo de cooperación inter-americana.** [Mycological explorations of tropical America: an example of inter-American co-operation.]—*Bol. Soc. venez. Cien. nat.*, vi, 45, pp. 219–237, 1940.

An interesting account is given of the mycological surveys of tropical America which have been undertaken during the past 25 years, the countries visited with this end in view including Puerto Rico, the Dominican Republic, Colombia, Venezuela, and Minas Geraes, Brazil. In 1939 the arrival of H. H. Whetzel and M. F. Barrus in Venezuela gave a strong impetus to mycological activity in that country, the number of collections from which now exceeds 4,000. Much of the literature comprising the bibliography of 51 titles appended to the author's résumé has been noticed in this *Review*, but attention may be drawn to the presence in Venezuela of two destructive pathogens, *Cercospora musae* on bananas [see above, p. 327] and *Ustilago zeae* on maize, as well as of *Ligniera vasculorum*, known to act as a parasite of sugar-cane [*R.A.M.*, xvi, p. 409] (also in Puerto Rico). Among the outstanding results of the surveys are the addition to the mycoflora of the above-mentioned countries of 360 species of fungi, the compilation of a list of economic plant diseases, and the accumulation of a valuable herbarium of tropical mycology at Cornell.

TAMAYO (F.). **Exploraciónes botánicas en la Península de Paraguaná Estado Falcon.** [Botanical explorations in the Peninsula of Paraguaná, Falcon State.]—*Bol. Soc. venez. Cien. nat.*, vii, 47, pp. 1–90, 18 figs., 1941.

Among the parasitic fungi collected by the writer in the course of a botanical survey of the Paraguaná Peninsula, Venezuela, in 1938–9, were *Cercospora sesami* on sesame [*R.A.M.*, xii, p. 296], *Puccinia purpurea* [? on sorghum], and *Physoderma zeae-maydis* [*P. maydis* on maize] all identified by A. S. Müller and C. E. Chardon.

WALKER (E. H.). **Recording localities on specimen labels.**—*Chron. bot.*, vii, 2, pp. 70–71, 1942.

A plea is made for accuracy and clarity in the attribution of localities on botanical specimen labels, objects which may be equally well secured by thorough and careful application of the old-fashioned 'distance and direction' method as by the various new and more complicated schemes lately propounded in the scientific literature, namely, Grassl's system based on latitude and longitude (*Bull. Torrey bot. Cl.*, lxiii, pp. 519–526, 1936); Reed's gridiron system (*Science*, N.S., xciii, 2403, p. 68, 1941); Hubrecht's and Erickson's system of latitudes and departures (ibid., 2412, p. 288, 1941); and Ives's system (ibid., xciii, 2422, p. 523, 1941). Distance should be given in the customary units of miles or kilometres, reckoned 'as the crow flies' from a particular city or town, calculating from the centre of the latter. Direction should be designated either by the points of the compass, or in degrees of departure from the north or any other cardinal point. It is important to select, as a point of identification,

some well-known place with a reasonable expectation of permanency. A typical record by this method would read, e.g., Md, Charles Co., 5·6 miles N. 21° E., or 5·6 miles N.NE., from Morgantown.

MATSUMOTO (T.). **Serological studies on the distribution and concentration of Tobacco mosaic virus in host plants. III. Measurement of virus 15–30 days after inoculation. IV. Measurement of virus 1–2 months after inoculation.**—*Trans. nat. Hist. Soc. Formosa*, xxxi, 214–215, pp. 306–313; 216, pp. 345–350, 8 figs., 1941. [Abs. in *Biol. Abstr.*, xvi, 3, p. 742, 1942.]

Continuing his studies on the distribution and concentration of the tobacco mosaic virus in its hosts after varying periods [*R.A.M.*, xx, p. 602], the writer found that the tops, growing tips, and roots contain less of the virus than the upper expanding leaves and the inoculated ones. Fifteen days after inoculation a small quantity of the infective principle occurs in the foliage below the inoculated leaves. The virus was observed to accumulate in larger amounts in the basal stems and light green areas of diseased leaves than in the upper stems and dark green sections. The midrib usually contains less of the virus than the leaf blade, but the content varies with the age of the leaves. One to two months after inoculation the virus is still most abundant in the inoculated leaves and those immediately above them. Between these and the expanding top there is a definite fall in the concentration, which increases at the apex and still more in the roots. Again the midrib generally contains less of the virus than the lamina, especially the pale green areas. The initially uniform distribution of the virus tends to become irregular as the plant matures.

Service and regulatory announcements. List of intercepted plant pests, 1940.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 71 pp., 1941.

Lists are given of the pests and diseases intercepted on plant products entering the United States during the period from 1st July, 1939, to 30th June, 1940 [cf. *R.A.M.*, xix, p. 192; xx, p. 336]. A new feature of the present issue is the listing of the diseases (1) alphabetically under the scientific name of the pathogen, (2) under the host, and (3) according to the country of origin. Phytopathological interceptions of special interest are 17 of citrus canker (*Bacterium* [*Xanthomonas*] *citri*), including one on lemon from (?) Spain; six of *Oospora citri-aurantii* on lime from Brazil, Cuba, Guatemala, Haiti, and Mexico; 15 of *Cercospora musae* on banana, including records from Cuba and Honduras; one of *Papulaspora coprophila*, which was apparently responsible for the decay of an onion bulb from Mexico; and seven of tomato spotted wilt from Mexico.

An index to previous interceptions has been prepared and is being checked with a view to publication.

Service and regulatory announcements October–December, 1941.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 149, pp. 96–103, 1942.

Particulars are given of the plant quarantine import restrictions obtaining in Malta and the Republics of Uruguay, Argentina, and Cuba.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xvi, 1, p. 4M, 1942.

PERU. While the agricultural authorities are exploring the possibilities of combating the 'spasm' disease of flax (*Sphaerella linorum*) by seed disinfection, the transport, sale, and sowing of seed produced in the Cajamarca Department is prohibited. Holders of seed originating in this region are required to notify the Department of Agriculture of all particulars concerning such stocks, and information must also be given of any sowings already made with seed produced in the prohibited zone.